MASTER'S THESIS

A Governance Framework of a Cloud Platform Ecosystem

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A GOVERNANCE FRAMEWORK OF A CLOUD PLATFORM ECOSYSTEM

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Abstract

Developing IT solutions in cloud environments have gained a lot of territory in the recent years and are expected to continue to grow in the future. Working together with other actors within a platform ecosystem will pose new challenges to all involved. New aspects to governance will be exposed as organisations move their data to cloud platforms and the question is how they will deal with them. New challenges appear that will have to be dealt with on working together with other actors within an ecosystem; how the cloud platform is managed and who has which responsibility; and of course also matters like security, policy, availability, responsibility and strategy. This research focuses on the development of a governance framework that will provide organizations that intend to move to a cloud platform, or organizations that need a check-up on their existing cloud platform ecosystem, to start and facilitate discussions between the relevant parties about relevant governance aspects. The development of the framework has been completed in a qualitative case study at a semi-large Dutch hospital planning to start working in a cloud platform ecosystem. The framework has been evaluated throughout semi-structured interviews among three distinct organizations working together in the same ecosystem.

Key terms

Governance, Data Governance, Cloud platform, ecosystem, Platform-as-a-service

Summary

Cloud computing is a disruptive technology with profound implications not only for Internet services but also for the IT sector as a whole. From this technology digital platforms have emerged as a major organizational form in various industries and they have changed how we consume and provide digital products and services. Digital platforms have become a leading business model thanks to the growth of companies like Google, Amazon, Facebook, and Apple. The products, services, and technologies that exist on those platforms act as a foundation upon which external innovators, organized as an innovative business ecosystem, can develop their own complementary products, technologies, or services. The Platform-as-a-Service (PaaS) model is one of the service delivery models in cloud computing that offer services to automate the deployment and management of applications, relieving application owners of the complexity of managing the underlying infrastructure resources. Many organisations acknowledge that data governance on cloud environments is critical, but platform governance and ecosystem governance are also needed to make this work.

This study develops a validated framework that can be used to identify the governance related aspects that need to be discussed and agreed upon by the participating organizations in a cloud platform ecosystem. Its main focus is on data governance, but other aspect of ecosystem and cloud governance are also covered.

Literature research found 20 elements in 7 dimensions within the themes ecosystem governance, cloud governance and data governance. The model has been validated in a single case study performed at a semi-large Dutch hospital and its partners currently working together in an on-premise environment, with the intention to move to a cloud platform ecosystem. The framework has been evaluated throughout semi-structured interviews among three distinct organizations working together in the same ecosystem. The limitation for this case is that it's not yet active on a cloud platform but has a concrete planning to do so in the near future.

Ecosystem governance

The study revealed that it becomes less clear where the decision authority lies within the ecosystem when moving to a cloud environment. When an organization moves to a cloud platform there will be an impact on the business objectives of the organization, but it is unclear if these should be discussed within the ecosystem or if these only apply to the leading organization. Setting up an SLA to formalize service agreements between ecosystem organizations can be a good way to align the business objectives.

Cloud governance

Respondents were divided about the question if the financial objectives are relevant, because they might apply only to each individual participant in the ecosystem separately. On the other hand, the pricing mechanisms on a cloud platform are significantly different and the costs of using the platform will depend on the choices made on the platform and respondents in general feel that this should be discussed in the ecosystem. A cloud platform will bring new tasks and activities to the organizations in the ecosystem and it is clear that these additional activities need to be addressed, either as an addition to existing roles, or as new, dedicated roles

Data governance

With regards to data governance most respondents indicated that the data governance elements that are used in on-premise environments would still apply in a cloud environment. However, respondents

seem to differ in opinions about the implementation. On one hand it is clear where responsibilities lie, but there should be some agreement on the ecosystem level. Some respondents seem to not want to give up control over data. Because of this ambiguity, elements regarding trust, transparency and control should be included in the framework.

Data Interoperability is connected to an exit strategy to be able to change between solution providers, system integrators or the cloud platform itself. Being able to access and transport your own data is an element that perhaps needs to be included in the framework after further investigation.

The element “transparency and accountability” within theme “data governance” is confusing when compared with “transparency and openness” on the “ecosystem governance” theme and should be excluded. Since this framework is viewed from the ecosystem level, this element should take precedence.

Although the responses received indicate that there is room to further refine and improve the framework, all respondents acknowledge that having such a framework is useful in daily practice. It contains the basic elements needed for a leading organization (like the hospital) to effectively start and coordinate the discussion between themselves and other participants in their ecosystem when initiating moving to a cloud platform. The framework can also assist currently active ecosystems who wish to challenge or benchmark the current situation and start discussions where need may be.

Since the selected case is not yet active on a cloud platform, follow-up research is recommended to validate the framework against an ecosystem for a hospital that already is active on a cloud platform. Since the organization active in such an ecosystem, might also be active in multiple other, possibly conflicting, ecosystems, it is recommended to further investigate these systems. This might lead to new insights as to whether this might cause conflict of interests. Finally, this study proposes further research on the exit strategy

Contents

List of Tables

List of Figures

1 INTRODUCTION

1.1 BACKGROUND

Cloud computing is a disruptive technology with profound implications not only for Internet services but also for the IT sector as a whole (Dikaiakos, 2009) (Atan, 2012). It has the potential to dramatically reduce the costs of services by commoditizing IT assets and on-demand usage patterns (Boniface, 2010). Cloud environments extend across corporate boundaries and bring new characteristics, deployment models and service delivery models (Al-Ruithe, 2018) that need to be addressed in a different way than in traditional computing environments. Digital platforms have emerged in that cloud environment as a major organizational form in various industries (Asadullah, 2018), they have changed how we consume and provide digital products and services (Hein, 2019). Digital platforms are being developed within a multi-actor setting, meaning that digital platforms comprise multiple components that are distributed among the control of different actors who try to influence and shape the design of a platform jointly (De Reuver, 2018).

Platform-as-a-Service (PaaS) is one of the service delivery models in cloud computing that offer services to automate the deployment and management of applications, relieving application owners of the complexity of managing the underlying infrastructure resources (Bassiliades, 2017). Since the first implementation of a Platform-as-a-service (Zimki in 2008) (Pavaskar, 2012), many new initiatives have been taken and the market size has grown from $283 million in 2010 to $4.1 billion in 2016, as shown in Table 1 (statista.com, 2017). Estimates from this research show that the total market size could go up to $8.6 billion in 2020.

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
283	549	940	1,516	2,279	3,148	4,144	5,172*	6,271*	7,294*	8,615*

** Estimated forecast*

TABLE 1: PAAS MARKET SIZE IN MILLIONS USD

The widespread cloudification and virtualisation promises increased flexibility, scalability, and programmability for the deployment of services by cloud providers (Mimidis, 2019). Considering that, the PaaS model provides software development tools, APIs, and code to help organizations streamline their application development (Planet Market, 2019), thus enabling the development of an ecosystem. Finding the right design and suitable governance concept are key to orchestrating a successful platform ecosystem for all stakeholders (Smedlund & Faghankhani, 2015). Organizations tend to work together on cloud platforms in ecosystems to be able to respond to changing market demands (Wareham, 2014). However, to be able to channel the efforts of heterogeneous actors in an ecosystem requires effective governance to prevent low-quality innovations to kill the platform (Wareham, 2014).

The adoption of cloud computing has been restricted because of several reasons, which are mostly about possible loss of control, privacy, security, data quality, data stewardship and data governance (Al-Ruithe, 2020). Cloud users can also be affected by operational and regulatory challenges when third parties come in play to store and process their data, while data complexity and data volume continue to grow and new demands rise to combine, manipulate and present information (Al-Ruithe, 2018, 2020).

When focussing on data governance, we see that in a traditional non-cloud environment it refers to the entirety of decision rights and responsibilities concerning the management of data assets in organisations, but that this definition does not apply equally to cloud computing contexts (Al-Ruithe, 2017). Poor implementation or lack of data governance can have significantly destructive effects on success of platform environments and the lack of adequate and appropriate technologies can hinder cloud data governance implementation in any organisation (Al-Ruithe, 2017). Platform users need to be guaranteed that their data is safe and transparently managed by the platform owners (Lee, 2019). Overall, moving data to the cloud will put organisations on a spot to make changes in data governance strategy, such as the organisation's structure and regulations, people, technology, process, roles and responsibilities (Al-Ruithe, 2017).

Not much research has been done around data governance in dynamic, multi-industry platform ecosystems (Al Ruithe, 2018)(Mukhopadhyay, 2019). As such, a better understanding of data governance in cloud computing environment is needed. This study aims to develop a framework that will help implementing governance elements onto cloud-based platform ecosystems.

1.2 EXPLORATION OF THE TOPIC

Platform ecosystem governance

Platforms are products, services, or technologies that act as a foundation upon which external innovators, organized as an innovative business ecosystem, can develop their own complementary products, technologies, or services (Gawer, 2013) where the fundamental architecture behind platforms in different fields are the same (Baldwin & Woodard, 2009). Digital platforms have become a leading business model thanks to the growth of companies like Google, Amazon, Facebook, and Apple (Tiwana, 2014). Governing platforms requires addressing tensions related to platform openness and control but also managing simultaneous collaboration and competition with complementors (Jovanovic, 2021).

Platform-as-a-Service (PaaS) systems are generally hosted, Web-based application-development platforms, providing end-to-end or, in some cases, partial environments for developing full programs online (Lawton, 2008). On these platforms, multiple organizations can work together in achieving the same goal. Jovanovic (2021) has defined a platform ecosystem as an evolving meta-organizational form characterized by enabling platform architecture, supported by a set of platform governance mechanisms necessary to cooperate, coordinate and integrate a diverse set of organizations, actors, activities, and interfaces, resulting in an increased platform value for customers through customized platform services

Cloud computing

The National Institute of Standards and Technology (NIST) defined cloud computing as a model for enabling omnipresent, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell, 2011). Cloud platforms extend across corporate boundaries and bring new regulatory, management of security (denial of service, intruder detection) and service deployment issues.

Jula (2014) has elaborated on the composition of cloud computing, consisting of the following:

CLOUD DEPLOYMENT MODELS

1. private
2. public
3. hybrid
4. community model

CLOUD SERVICE DELIVERY MODELS

1. software as a service (SaaS)
2. platform as a service (PaaS)
3. infrastructure as a service (IaaS)

In our research we will focus on the PaaS delivery model within public, private or hybrid clouds.

The ecosystem around PaaS environments has expanded greatly in the last few years (Kerherve, 2019) with more and more developers have chosen to create their applications in cloud environments (Fortis, 2012), enabling the growth of PaaS services to support them. While PaaS systems offer a de-coupling of the underlying infrastructure (Kerherve, 2019), the gained flexibility also poses a more rigid approach to governance (Lee, 2017). Hein et al. (2019) described three building blocks to characterize digital platform ecosystems:

- Platform ownership (power distribution within the ecosystem)
- Platform value-creating mechanisms (interaction between complementors and consumers)
- Complementor autonomy (the degree of freedom complementors have)

For our research we focus on the PaaS environment. In this particular environment, the platform providers are primarily software businesses and access to knowledge regarding ecosystem health limited to the non-platform owners (Lucassen et al., 2013). This means that PaaS environments have a conceptually different approach to ecosystems as opposed to environments in which platform owners collaborate with the ecosystem. Using the typology from Hein et al. (2019) we schematize the following ecosystem:

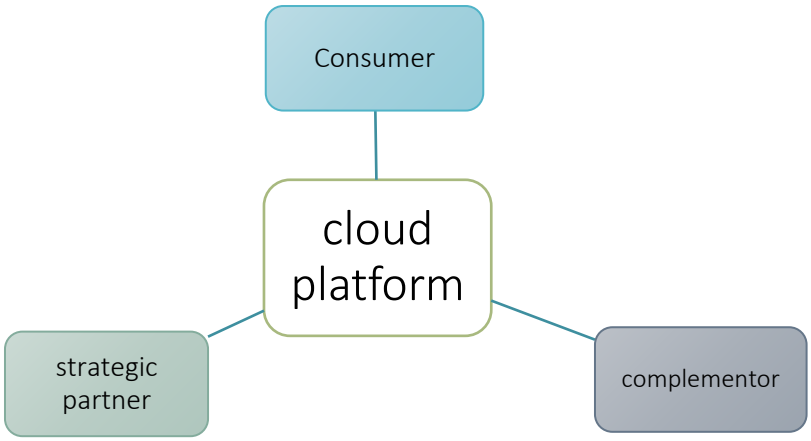

FIGURE 1: OVERVIEW OF CLOUD ECOSYSTEM

Data governance

Davenport (2007) stated that companies need enterprise-wide data strategy and governance to achieve competitive advantage. Van 't Spijker (2014) confirms this by stating that through digital

platforms, consumers are now able to co-create products as opposed to producer driven marketplaces. Governance in general is about what decisions must be made to ensure effective management and use of IT (Kahtri, 2010). When we look at IT governance in particular, it can be defined as an integral part of enterprise governance and consisting of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategy and objectives (De Haes & Van Grembergen 2004).

According to the Data Governance Institute (2015) Data Governance means ''the exercise of decision-making and authority for data-related matters." More specifically, Data Governance is ''a system of decision rights and accountabilities for information-related processes, executed according to agreed-upon models which describe who can take what actions with what information, and when, under what circumstances, using what methods."

Many organisations acknowledge that Data Governance on cloud environments is critical (Singh, 2019), but to make this work, platform governance is also needed. There are five key aspects of platform governance design that need close consideration: the meta-organisation or ecosystem design, coordination mechanisms, mechanisms for value co-creation, value appropriation mechanisms and architectural principles (Mukhopadhyay, 2019). Also, governance on platforms requires a delicate balance of control between the platform contributors (Hein, 2019).

1.3 PROBLEM STATEMENT

The possible services that can be created in a PaaS ecosystem are widespread and a result of the collaboration between strategic partners, complementors and consumers. If multiple parties are involved in creating value on a cloud platform, it's the question in which way each party will take responsibility in technical, functional or legal way. Governance in such an environment will be implemented differently than in non-cloud environments. Little research has been done on the validity of traditional governance elements in cloud environments within the context of an ecosystem.

1.4 RESEARCH OBJECTIVE AND QUESTIONS

The objective of this study is to design and validate a governance framework of a digital platform ecosystem in cloud environments. The initial governance framework will be developed by conducting a literature review. Then we will evaluate it empirically by conducting a case study and potentially add more to the initial governance framework.

This study aims to contribute to the knowledge about governance frameworks for digital platform ecosystem in cloud environments by answering the following research question:

WHAT DOES A FRAMEWORK OF GOVERNANCE OF A CLOUD PLATFORM ECOSYSTEM LOOK LIKE?

The objective of the research can be addressed in the following sub questions:

- What are the current governance frameworks in the cloud platform ecosystems literature?
- What are the dimensions and mechanisms that characterize digital platform governance?
- How can this information be integrated into a theoretical framework?
- How can the information in the framework be validated in practice?
- How can the framework be refined with practical information?

In chapter 2 we will try to find answers to which dimensions, mechanisms, and practices characterize digital platform governance, which characteristics are related to data governance in digital platform

ecosystems and how can this information be integrated into a theoretical framework. We will then validate the framework in practice in chapter 5.1 and find an answer on how to further refine the framework based on practical information in chapter 5.3.

1.5 MOTIVATION/RELEVANCE

Developing IT solutions in cloud environments have gained a lot of territory in the recent years and are expected to continue to grow in the future. If managed correctly, data can become an organization's most valuable asset, helping it to remain competitive and agile, to proactively meet customer needs, and to keep costs in check (Panian, 2010). Data governance is needed to prevent organisations from having to suffer from the consequences of poorly managed data. Finally, Al-Ruithe (2018) concludes that not much research has been done on data governance in cloud environments and that platforms require a different approach for data governance.

Data governance plays a significant role in determining cloud platform success, practitioners can use this data governance framework to evaluate and improve the data governance mechanisms of their cloud platform implementations; we, therefore, try to be of added value for the business as well.

1.6 MAIN LINES OF APPROACH

In this chapter we described an introduction to data governance on cloud platforms. In the coming chapters we will first research existing literature to find the work that already has been done in this field and synthesize a new theoretical framework that will help in answering our research question. After this we will describe in which way the empirical research will be performed and methodology is used. After the research is executed, we will compare the results against the developed theoretical model and draw conclusions from that and recommend a proposal for possible future research.

2 THEORETICAL FRAMEWORK

2.1 RESEARCH APPROACH

The theoretical foundation for the data governance framework for a platform ecosystem in a cloud environment will be developed in this section. We conduct a structured literature Review method to identify governance mechanisms for a platform ecosystem in cloud environment to form our initial framework. In this literature review we aim to answer to the following questions:

- What are the current governance frameworks in the cloud platform ecosystems literature?
- What are the dimensions, mechanisms, and practices that characterize digital platform governance?
- How can this information be integrated into a theoretical framework?

For going through the existing literature in a structured way, Al-Ruithe (2018) used a selection process that starts widely and narrows the selections down by following clear and logic steps (see Figure 2). This process will allow us to quickly find and select the relevant literature in a concise way.

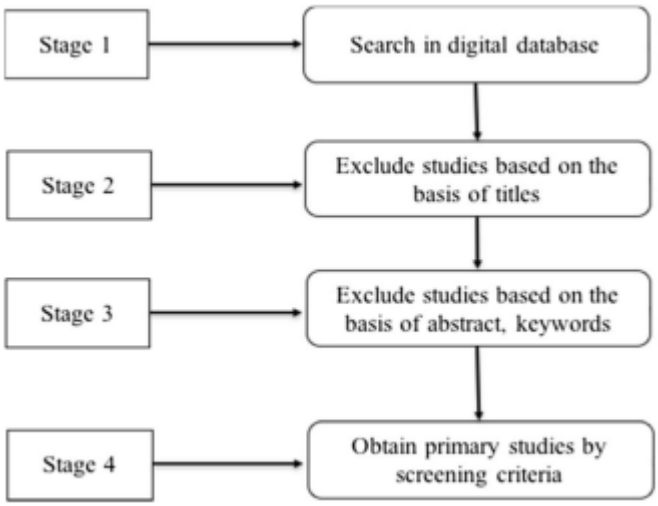

FIGURE 2: LITERATURE SELECTION PROCESS

In our study we will apply this process for each search query to narrow down to relevant articles. For this we only use the Open University's database for searching (stage 1). We will then make a primary selection based on the title of the paper. Including the word "cloud" in our search query will also give back articles that concern environmental issues, which can easily be detected based on the title of the article (stage 2). For the articles that prove most relevant to our research, a closer look will be taken to determine in what way the paper matches the research question (stage 3), based on the abstract (or, if absent, the first paragraph of the paper). This differs from the proposed selection process, because the keyword selection is already considered in stage 1. The final shortlist of literature will be downloaded and investigated in more detail (stage 4).

Applied Search Query

((SubjectTerms:("data governance")) OR (SubjectTerms:("platform governance")) OR (SubjectTerms:("cloud governance")))

The search query was performed against the OU database using the following filters:

- Peer Reviewed articles only
- All Publication dates

The following criteria were used to determine relevant articles:

Inclusion criteria

- Studies about governance of platforms in general, or data governance within a platform in particular
- Studies that target cloud environments
- Studies that cover the Platform-as-a-service concept

Exclusion criteria

- Environmental studies (because of the term "cloud")
- Studies that cover the technical infrastructure of cloud environments
- Studies that are about platform supplier competition
- Studies that cover societal, legal or political governance
- Not written in English

Data extraction & synthesis

Once the final list of relevant research studies is available, we need to analyze and synthesize them. Cooper (2019) has defined research synthesis as the conjunction of a particular set of literature review characteristics and explained their primary focus and goal to integrate empirical research for the purpose of creating generalizations. Following the method as described by Saunders et al. (2019, p. 111) we will break down the individual studies into parts by using review questions. For this we will use a data extraction form (see Appendix B1 to B9) to be able to catch the parts and from there create those generalizations.

Our review template contains a section where we determine the relevance of the selected literature by means of a list of specific review questions and register the governance characteristics found in the literature. Next, Saunders (2019, p112) discussed the use of the Thematic Analysis Grid for reviewing the literature, by applying these 5 steps:

1. Identify potential themes from the initial reading of all articles
2. Re-read all articles, add a row to the grid and make brief notes under the themes
3. Make a notation about the methodology used
4. Add or remove new themes if necessary
5. Look for emerging patterns across the themes. Look for consensus and contradictions.

We will process the selected articles one by one following the steps above to complete the grid.

Validity & reliability

For our literature research, we act on the construct validity by making a review template (appendix B) to enforce a review procedure is used as proposed by Saunders et al. (2019, p. 111). To further increase the construct validity and improve the reliability, we describe inclusion and exclusion criteria and we will methodically describe the steps we are going to take in our theoretical research.

To improve the internal validity of our research we are using a Design Science research method, this proven method reflects theoretical findings in a case study. We will reflect on our theoretical findings in a single case study.

The generalizability of our literature research is limited to data governance for cloud platform ecosystems, which later will only be reflected in a single case study in an organisation in the Netherlands that has adopted data governance on a cloud-based platform. The extent to which the findings on the governance framework are generalizable is very limited and more extensive research is necessary to improve the framework itself.

Bias

Bias includes any and all distortions during the investigation process, which can occur in any type of design (Almeida, 2017). The types of biases that are specific to systematic reviews are: selection bias, information bias, and confounding bias.

Selection bias

We face a certain amount of selection bias by only selection English written literature and only searching the Open University's database. Any literature that is not accessible via OU, or written in non-English, is missed. We have aligned this with the supervisor, and we expect both subjects to not influence the outcome of this thesis.

Information bias

These are measurement errors that may occur by misclassifying the found literature as relevant to our research. Because we use a 4-stage approach to systematically review the literature as well as using a standardized data extraction form, this bias is not likely to occur.

Confounding bias

Almeida (2017) states that confounding is not a usual bias for qualitative systematic reviews. However, the search phrase "cloud" has a double meaning that can cause unwanted search results. We can prevent this from happening by adjusting the inclusion/exclusion criteria.

2.2 IMPLEMENTATION

After following the proposed steps in chapter 2.1, we found a total of 119 articles. After assessing the titles of these articles, we were able to eliminate 84 of them bringing the total number down to 35 after the second step. The remaining articles were opened to examine the abstract to see in what way these could be relevant to our research. The remaining 21 articles were examined in full and selected based on their contents regarding either cloud-, platform- or data governance. That resulted in 9 usable articles, see appendices B1 through B9 for an analysis of those articles.

Appendix A1 shows the process that was followed including the results in articles by year of publication. Appendix A1 also contains a table that shows how the selection process in the literature review took place. Each article in that list is numbered and evaluated in accordance with the selection process. A "1" in column "stage 2" means that the title of the article was evaluated and found eligible for stage 3. A "1" in column "stage 3" means that the abstract of the article showed enough confidence in the validity of the article to let it proceed to stage 4. In the last stage the remaining articles were read in full and assessed. A "1" in column "stage 4" means that the article will be considered for the literature review.

2.3 RESULTS AND CONCLUSIONS

From our initial reading of the articles we derived the following themes: Cloud governance, Security Governance, Platform Governance, Ecosystem Governance and Data Governance. Within Data Governance we found the following sub-themes: Cloud vs. Non-Cloud, Decision Domains, Scoping (Data, Domain, Organizational), Critical Success Factors and Enabling Factors. "Platform Governance" and "Cloud Governance" are closely related in a Platform as a Service environment, so we join the two themes together.

This was the first step in our literature review with which we will progress into the next stage. In chapter 2.3.1 we review the available literature and asses which parts of the studies are relevant for ours and place notes under the appropriate theme. We also will add, remove or modify themes if necessary. In chapter 2.3.2 we then make a final integration of these parts into our selected themes.

2.3.1 LITERATURE REVIEW

In their research, Schreieck et al. (2017) concluded that governance of platform ecosystems differs between commercial and non-profit contexts. In a commercial environment the platform owner can apply formal and informal control mechanisms to ensure quality in a centralized manner, whereas for non-profit environments the platform owner has no legitimation to apply control from the platform contributors' point of view. Although PaaS environments are commercial in nature, the same logic applies to them in our research (see chapter 1.2), because these platforms have owners who are not expected to collaborate on the platform implementations themselves (merely facilitating). In most

platform ecosystems, the mechanism of pricing is relevant as an additional mechanism for the platform. Contents from the article from Schreieck are placed in the themes Cloud governance, Ecosystem governance and Tools & Measurement.

In order to be able to manage cloud resources effectively, organizations will need to participate in partner-based knowledge sharing and have appropriate governance structures in place. Prasad et al. (2014) suggested 4 possible structures: Chief cloud office, cloud management committee, cloud service facilitation center and cloud relationship center. The role of these structures to fit the resources that cloud environments offer into organizations business processes in order to achieve the advantages intended. Since our research focusses on the ecosystem (thus cooperation of partners), this seems especially relevant. We place these elements in "Ecosystem governance".

Data governance differs significantly for cloud and non-cloud environments. By analyzing the available knowledge in the public domain, Al-Ruithe et al. (2018) found 8 dimensions for data governance that are key for cloud computing environments. These are: cloud deployment model, service delivery model, cloud actors, service level agreements (SLA), data governance function, data governance structure, technical and measuring and monitoring tools. These have a partial overlap with the data governance elements for non-cloud environments, mentioned in their research as well. Since these elements have a widespread, we divide them between "Cloud governance", "Data governance" and within the latter create the subthemes "Roles & Responsibilities" and "Tools".

Alhassan et al. (2016) performed a literature study and were able to connect 264 concepts of data governance to 5 decision domains, 3 actions and 8 areas of governance. They used an open coding standard and counted the frequency of those concepts. The decision domains used were: data principles, data quality, metadata, data access and data life cycle. The 3 actions regarding data governance: define, implement and monitor. 8 areas of governance: 1) data roles and responsibilities, 2) data policies, 3) data processes and procedures, 4) data standards, 5) data strategy, 6) data technologies, 7) data guidelines, and 8) data requirements. They concluded that the most frequent activities were defining data roles and responsibilities, data policies, data processes and procedures and data standards. Although these subjects seemed relevant when selecting the article, we now find that this article is not eligible for our research. The terms that are most frequently used in Data Governance research are not relevant.

Abraham (2019) has created a holistic view on data governance by distinguishing between structural, procedural and relational governance mechanisms. Together with scopes regarding organization, data and domain, they completed their framework. They described the external and internal factors that precede the adoption of data governance practices. Those factors have an impact on the implementation of data governance and concern strategic, organizational and cultural elements. Abraham also identified two types of consequences of data governance: intermediate performance effects and risk management. We created a new subtheme under Data governance named "Process, Procedure, Policy" and divided these elements across all themes (except Tools).

In a theory building research, Alhassan et al. (2019) used the five decision domains identified by Khatri and Brown (2010) (data principles, data quality, metadata, data access and data life cycle) as an initial lens to identify the CSFs for data governance. Seven core categories emerged that are considered to be CSFs for data governance: Employee data competencies, Clear data processes and procedures, Flexible data tools and technologies, Standardized easy to-follow data policies, Established data roles and responsibilities, Clear inclusive data requirements, Focused and tangible data strategies. We divided these elements across all themes (except Cloud Governance).

Al-Ruithe (2018) created a taxonomy of data governance for both cloud and non-cloud environments. In total they selected 46 cloud elements in 10 categories and for non-cloud 13 elements in 3 categories. Since our research focusses on the cloud platform, we only used that part of the taxonomy and divided the categories across all themes. We are not interested what happens on a technical level on the platform, so that category was left out.

Rebollo (2014) developed a comprehensive security governance framework that is suitable for cloud computing environments. They proposed the following cloud computing lifecycle: (1) Planning/Strategy Definition; (2) Cloud Security Analysis; (3) Cloud Security Design; (4) Cloud implementation/Migration; (5) Secure Cloud Operation and (6) Cloud Service Termination. Since these elements are all related to cloud governance, we placed it in that theme and removed "Security Governance" as a distinct theme.

After considering the contents of the theme "Tools" we renamed it to "Tools & Measurement" to have a better overall fit to the contents. We made no other adjustments. The results of the complete thematic process can be found in appendix A2.

2.3.2 SYNTHESIS

The following themes were derived from the literature review process: Ecosystem governance, Cloud governance, Data governance and its subthemes Roles & responsibilities; Process, Procedure & Policy and Tools & Measurement. In the rest of this paragraph we will make a summary of each theme following the literature review in the previous chapter. In Table 2 we show the final proposed framework.

Ecosystem Governance

According to Tiwana (2014), platform governance can be defined as the "partitioning of decision-making authority between platform owners and app developers, control mechanisms, and pricing and pie-sharing structures."

For the theme 'Ecosystem Governance' it is clear that ensuring active participation of stakeholders within the ecosystem is needed (Abraham, 2019) and that participants should adopt transparency, enhance trust so perceived risk can be reduced, and openness (Schreieck, 2017). When implementing Data Governance, it will influence stakeholders on data-related decisions and actions, so people and organizational bodies play an important role (Al-Ruithe, 2018).

The overall governance structure of an ecosystem can be centralized or decentralized, which accounts for the distribution of decision rights (Schreieck, 2017). Unclarity on these rights could result in loss of control on data and low-quality information products and to prevent this, data integration and usage policies need to be set up (Abraham, 2019). Develop a cloud data governance level agreement between the platform actors related to cloud data governance as part of the overall strategy (Al-Ruithe, 2020).

Cloud Governance

Organizations should have governance structures in the form of cloud actors in place for managing cloud resources and participating in cloud processes (Prasad, 2013)(Al-Ruithe, 2018). These structures should relate to the organisation's cloud business objectives and indirectly to their financial objectives (Prasad, 2013). In an open ecosystem, control mechanisms should be in place to ensure that the cocreation of value can be coordinated (Schreieck, 2017). When data is no longer under direct control of the consumer, service level agreements (SLA) between cloud consumer and provider are needed

(Al-Ruithe, 2018)(Al-Ruithe, 2018). Also, governing cloud environments is closely related to integration with cloud deployment models and cloud service delivery models and organizations should identify the critical success factors as well as execute change plans regarding: education and training, change management, and cloud data governance (Al-Ruithe, 2018)(Al-Ruithe, 2020).

Concerning the security of cloud environments, organizations need to perform a security risk assessment to identify threats and mitigate vulnerabilities (Rebollo, 2014). The ISGCloud Security Governance Framework consists of 6 activities concerning planning, analysis, design, implementation, operation and termination. For each activity specific tasks and steps are formulated for deployment of security governance during the entire cloud lifecycle (Rebollo, 2014).

Data Governance

Data governance reduces these risks by creating risk-mitigating policies and introducing controls for monitoring compliance (Abraham, 2019). Activities in the data governance function can be considered as master activities for implementing DG; they result in responsibilities, processes and procedures (Al-Ruithe, 2018). Data Governance is attributed to improving data quality due to increased accuracy, availability, completeness, consistency, and timeliness of data and the limitation of errors due to data inconsistencies (Abraham, 2019).

Before launching the formal programme it is important for the organization to define the DG requirements and be transparent and accountable about it (Al-Ruithe, 2018). The appropriate roles are needed to collaborate to formulate data governance elements (Al-Ruithe, 2018). Top level management support in this phase is essential (Al-Ruithe, 2018). The data governance team must define all data governance policies that address cloud consumer's concerns (Al-Ruithe, 2018) as well as legal factors that should be included in the DG design (Al-Ruithe, 2018).

Roles & Responsibility

Organizations must include specific cloud actors and clearly specify their roles and responsibilities, because of their special status (Al-Ruithe, 2018)(Al-Ruithe, 2018). A committee for data governance in charge of defining the data owners can be used for that (Alhassan, 2019). Also, the participant roles at every managerial level need to be involved (Rebollo, 2014). And structural governance mechanisms should be in place to determine reporting structures, governance bodies, and accountabilities (Abraham, 2019).

To enable the collaboration between stakeholders, organizations can implement relational governance mechanisms to facilitate them. These mechanisms encompass communication, training and the coordination of decision making (Abraham, 2019).

Process, Procedure & Policy

Before implementing a cloud data governance programme, the most important processes and procedures should be considered to identify the cloud data governance requirements. The cloud data governance office is responsible for its design (Al-Ruithe, 2020).

Centralizing the approach on business and IT on a corporate level facilitates the adoption of data governance (Abraham, 2019). In that way it would be easier to embed data processes, data procedures and data policies into the systems (Alhassan, 2019).

Procedural mechanisms should aim to ensure that data is recorded accurately, held securely, used effectively, and shared appropriately (Al-Ruithe, 2018). Processes should be standardized,

documented and repeatable (Al-Ruithe, 2018). And policies describe methods to govern data (Al-Ruithe, 2018).

Tools & Measurement

To increase the reliability of the data governance process in a cloud environment (Al-Ruithe, 2018), measurement is needed. It can be used for overall progress and detected issues (Rebollo, 2014), if incoming and existing data meets business rules (Al-Ruithe, 2018)(Al-Ruithe, 2018) and if SLA conditions are followed (Al-Ruithe, 2018).

More in general, the effectiveness of data governance can be measured as the ratio of the number of preventive data quality management measures to the total number of data quality management measures conducted (Abraham, 2019).

To measure cloud data governance, metrics and key performance indicators should be developed using modern technology (Al-Ruithe, 2020). The cloud data governance office is responsible for determining the requirements and critical success factors

The chosen platform should have enabled boundary resources such as standardized application programming interfaces (APIs) to enable developers to access the platform and contribute to it (Schreieck, 2017).

Conclusion

We conclude our literature review and synthesis with the summary in Table 2. For this proposed framework for a cloud platform ecosystem we found that the main elements are Ecosystem governance, Cloud governance and Data governance. Since the articles do not integrate these different themes, this framework needs to be validated and refined in the rest of the research.

Governance dimension	Governance mechanisms	Governance element	Description	References
Ecosystem Governance	Decision making	Authority	In a PaaS (Platform as a Service) environment, the platform owner is not part of the ecosystem.	**Schreieck, 2017**
		Pricing	PaaS facilitates the development and deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers	**Schreieck, 2017**
	Trust and participation of stakeholders	Activie participation	Creating awareness, ensuring active participation of stakeholders	**Abraham, 2019** **Al-Ruithe, 2018**
		Decision making method	The overall governance structure can be centralized or decentralized, which accounts for the distribution of decision rights.	**Schreieck, 2017**
		SLA	Setting up an SLA between CPE organizations is a more formal way of governing the environment.	**Al-Ruithe, 2020**
		Transparency and openness	From an ecosystem perspective, participants should adopt transparency and openness to enhance trust so perceived risk can be reduced.	**Schreieck, 2017** **Al-Ruithe, 2020**
Cloud Governance	cloud general	Business objectives	Cloud structures should relate to the organisation's cloud business objectives.	**Prasad, 2013**
		Cloud deployment model	Cloud environments have 4 different deployment models.	**Al-Ruithe, 2019**
		Cloud specific roles	Organizations should have governance structures in the form of cloud actors in place for managing cloud resources and participating in cloud processes	**Al-Ruithe, 2019** **Prasad, 2013**
		Financial objectives	Cloud structures should relate indirectly to their financial objectives	**Prasad, 2013**
		Training	Employees need to be trained to adequately manage the cloud features.	**Al-Ruithe, 2020**
Data Governance	General	Data governance decisions	The data governance function can be considered as a collection of master activities for implementation of data governance. It introduces controls for monitoring compliance and reduces risks by creating risk-mitigating policies.	**Al-Ruithe, 2019**
		Management support	Top-level management needs to provide support for migrating to cloud environments.	**Alhassan, 2019** **Abraham, 2019** **Al-Ruithe, 2018** **Al-Ruithe, 2020**
		Transparency and accountability	Before launching the formal programme it is important for the organization to define the DG requirements and be transparent and accountable about it.	**Al-Ruithe, 2018** **Al-Ruithe, 2020**
	Roles & Responsibility	Roles	Clearly specified roles and responsibilities of that roles will help actors within organizations to understand what is required from them.	**Al-Ruithe, 2018** **Al-Ruithe, 2019**
		Responsibilities	Clearly specified responsibilities of the defined roles.	**Al-Ruithe, 2018** **Al-Ruithe, 2019**

		Stakeholder collaboration	To enable the collaboration between stakeholders, organizations can implement relational governance mechanisms to facilitate them. These mechanisms encompass communication, training and the coordination of decision making.	Abraham, 2019 Rebollo, 2014
	Process, Procedure & Policy	Process, Procedure & Policy	Processes, procedures and policies aim to ensure that data is recorded accurately, held securely, used effectively, and shared appropriately.	Alhassan, 2019 Abraham, 2019 Al-Ruithe, 2020
		standardization, documentation and repeatability	This involves standardization, documentation and repeatability of CPE processes.	Al-Ruithe, 2018
	Tools & Measurement	API availability	The availability of API's on a cloud platform are an important factor for developer interaction.	Schreieck, 2017
		Tools & Measurement	To increase the reliability of the data governance process in a cloud environment, measurement is needed. It can be used for overall progress and detected issues, if incoming and existing data meets business rules and if SLA conditions are followed.	Abraham, 2019 Al-Ruithe, 2018 Al-Ruithe, 2019 Al-Ruithe, 2020 Rebollo, 2014

TABLE 2: PROPOSED FRAMEWORK FOR GOVERNANCE OF CLOUD PLATFORM ECOSYSTEMS

2.4 OBJECTIVE OF THE FOLLOW-UP RESEARCH

The aim for this study is to create a governance framework that applies to cloud-based platform implementations within a collaborationary ecosystem. Our objective of the follow-up research is to validate the framework by performing a single case study. Since this research is not about the way governance is implemented in a single organisation, we need access to a case in which multiple organisations work together on the same cloud platform.

3 METHODOLOGY

We use Design Science research as the main research methodology for this study. Peffers (2007) has synthesized a theoretical model for Design Science Research Model (DSRM) on Information Systems Research, that meets three objectives: it is consistent with prior literature, it provides a nominal process model for doing DS research, and it provides a mental model for presenting and evaluating DS research in IS.

The design phase has been covered in chapter 1 and 2 of this thesis by performing a literature review and synthesizing its results. In chapter 4 we will continue with the evaluation phase by evaluating if the proposed framework is valid in practice and potentially needs refinement.

3.1 CONCEPTUAL DESIGN

We want to validate our developed framework from chapter 2 in a real-life situation to find out if the chosen elements are valid in practice and if additional elements need to be added. To do this we will perform a case study at an organisation that is already active in a cloud-based platform ecosystem, and where a collaboration exists between different stakeholders (actors). We perform the evaluation at the ecosystem level and need at least three autonomous organisations within that ecosystem to better evaluate the different perspectives on the platform. Since we want to validate our framework against 1 implemented instance (and due to time limitations of this study) we will focus on a single case study and not multiple case.

Since we want to do an inquiry into a current implementation of a cloud-based platform ecosystem where different opinions might exist about why an element should or should not be included in the framework, we need in-depth insights into the reasoning behind it. A survey would not be sufficient to reach this goal. Although a case study has its limitations because only one case is researched and the results of the study depend on the context within that single case organization (Saunders, 2019), case studies are the most used research method for evaluating a conceptual framework (Saunders, 2019) and is an in-depth inquiry into a topic or phenomenon within its real-life setting (Yin, 2018). Therefor we chose this as our research method.

To be able to catch all reasoning provided by the respondents, we will set up a semi-structured interview. In this way we will have a base line of questioning while being able to react to responses given by asking follow up questions. This will help us in creating an in-depth insight. Managers and other employees are more inclined to agree to an interview, and less to responding to questionnaires, especially if the research topic is seen as relevant (Saunders et al., 2019, p. 444-447).

Regarding our sub questions, in this chapter we will answer the following:

- How can the information in the framework be validated in practice?
- How can the framework be refined with practical information?

3.2 TECHNICAL DESIGN

Case organization

We want to evaluate the validity of our framework in a real-life situation within the healthcare domain. We choose this domain because patient's healthcare data is one of the most sensitive data in terms of privacy and as Al-Ruithe (2019) stated, security and privacy are two of the technological barriers to implement data governance in cloud environments. By performing the case study in this field, we expect to be able interview people who are aware of the risks of managing data on a cloud platform. It is to be expected that the organisations who participate in the ecosystem have had more intensive discussions about how to manage the risks, than non-healthcare organisations.

We want to get in-depth insights on the topic under investigation from different actors in a real-life situation of a cloud-based platform ecosystem. In the platform ecosystem six types of stakeholders are identified: (1) data providers, (2) data consumers, (3) software & technology vendors, (5) accounting & auditing firms, and (6) non-profit organizations (Otto & Jarke, 2019). For our research we select only the first three stakeholders for scoping reasons.

Our selected case should meet the following criteria

- A cloud platform ecosystem in a healthcare environment
- Ecosystem actors in active cooperation together
- Experience in cloud governance and data governance

Then within the case study (i.e., a cloud-based platform ecosystem) knowledgeable persons from each actor will be identified to participate in our study. They require to have a profound understanding of data governance, cloud computing and are aware of the ecosystem surrounding it, have a relevant background/function and a higher educational degree. Finally, they need to be able to provide arguments and explanations for their answers. Preferably 2 or 3 persons for each actor in the ecosystem in order to provide a solid base for making conclusions. The cloud platform itself is "as-a-service" and as such not part of the ecosystem and therefor out of scope.

Data collection

As stated in paragraph 3.1 we will collect the data for our study by conducting a semi-structured interview. The advantages of this method are (Saunders, 2019):

- The questions are prepared in advance and can be used as a guidance while conducting the interview.
- Because the questions we ask are open-ended and also because each respondent will reply to the questions in their own context within the ecosystem, we want to build on the responses given to be able to explore the context of the respondent.
- Personal contact with the respondents to be able to read any nonverbal signals

The interview will consist of 3 sections. The primary section where the respondent can give his/her opinion about what should be included in the framework, before they are biased by our framework. The second part of the interview will be used to validate the framework by inquiring if the governance elements from the framework are relevant and respondents will be asked for the reasoning behind it. In the closing part of the interview we'll ask if the respondents can think of any element we missed during the interview and how they feel about the relevancy of the framework itself in practice.

All interviews will be recorded to prevent excessive note taking. Permission will be asked on forehand. The recordings will be deleted after they have been processed. Recording the interview will give the interviewer a maximum amount of time to listen to the answers and think about follow-up questions during the interview.

Before commencing the actual interviews, we will set up a pilot interview. Goal for this interview is to determine if our questions are clear and to test our style of interviewing and researcher bias. The pilot will be held with a person with a profound knowledge of the subject matter and is able to assess the interview protocol itself.

See appendix C for the complete list of questions. We will need at least 3 respondents per ecosystem participant, so we aim at a total of 9 respondents.

3.3 DATA ANALYSIS

All interviews will be transcribed and analysed. This will not only process all that is said, but also allows for recording the way in which it was said. A transcription summary will be provided to make the core of what was said more easily readable.

The finished transcription will be shared with the interviewee for final checking. This will be helpful for ensuring factual accuracy. Saunders et al. (2019) warn us about interviewees that want to change their grammar and use of language. In our cover letter, attached to the transcription, we will state to only check for factual accuracy, since the transcriptions will be translated to English after approval.

We will analyse the retrieved data by using the Deductive Explanation Building (DAB) method. This method is used to build an explanation by testing and refining a predetermined theoretical proposition (Saunders, 2019, p. 665-666). Although we do not seek an explanation for a specific phenomenon in the theory, with our framework we do have developed a proposition that we seek to test in a case study. DAB requires as many case studies as needed in order to perfect the proposition, which is what is needed for our framework as well, but what we will not do for this study because of time limitations. Since the themes for our research have already been derived in chapter 2.3, we do

not need to search for themes within our data set after it has been collected. Therefor the Thematic Analysis method is less applicable.

Our research subject is to validate and possibly refine our proposed framework. We've created a list of a priori codes in our theoretical work in chapter 2, and we will use this to map the answers from respondents to. The way that respondents give answers can vary. In order to be able to decide if a framework element should be included in the intended framework, we set up a coding to table. In Table 3 you can find the definition on how we determine if a respondents answers positively or negatively to the question.

AGGREGATION	CODED ANSWER	MEANING
POSITIVE	Yes	Fully agree
	Yes, but	Conditionally agree
NEGATIVE	Maybe	Agree only in certain cases / uncertain
	No	Do not agree

TABLE 3: PLANNED CODING OF ANSWERS OF RESPONDENTS

Next, the substantive comments (acquired by asking the why-question and the follow up afterwards) will be ordered by respondent and by the respective theoretical code which will allow us to make summary of the answers for each framework element. We will present these in paragraph 4.4, 4.5 and 4.6.

Finally, based on the responses we get, we will decide if any theme needs to be added to the framework or altered in any way to better suit the situation in practical situation.

That leaves the responses to the preliminary and closing questions to be analysed. In the interview we specifically will ask the respondents about important elements that should be included on forehand, and check if we missed anything afterwards. We will simply evaluate the answers to these questions against the already refined framework to see if they match any of the existing elements or that new elements should be added or researched in a follow up study.

3.4 REFLECTION W.R.T. VALIDITY, RELIABILITY AND ETHICAL ASPECTS

There might be some data quality issues when conducting semi-structured interviews. Saunders (2019, p. 447) defined 5 types:

- Reliability/dependability
- Forms of bias
- Cultural differences
- Generalisability/transferability
- Validity/credibility

Reliability

Research reliability is about being able to reproduce an earlier research and achieve the same outcomes (Saunders, 2019, p. 213). But semi-structured interviews are not necessarily intended to be repeatable, because their purpose is to measure the situation at hand at the time it was measured (Saunders, 2019, p. 449). So using interview protocol will enhance the reliability of the interview process. Also, when choosing this type of approach, it is important to describe our research design in detail, the reasons for making the choice of strategy and methods. We will be documenting the process and procedures and provide a detailed description of our coding method for the interview transcripts. We also simplify the wording in indicators so that there is less room for misinterpretation.

Since the interviewer can be considered a knowledge expert in the field being researched, some type of researcher bias might occur. Related to this is the response bias where the interviewee might think that the interviewer will understand context well enough to not give answers in full detail. Saunders (2019, p. 452) suggested that developing interview themes and supplying the information to the interviewee before the interview, will help in overcoming the interview bias.

In summary, to improve the reliability of the research we will (1) an interview protocol submitted to the respondents on forehand, (2) extensive description of our research design, (3) detailed description of our coding method and (4) description of the data analysis and further refinement of the framework.

Ethics

Research ethics are a critical part of formulating a research design. It guides the conduct of the researcher regarding the personal rights of those who are affected by the research (Saunders, 2019, p. 252). In our case study, we perform interviews with people on key positions within the organisations involved within the ecosystem. Since there might be a competitive relationship between multiple actors within the ecosystem, we need to be careful about showing results that might lead back to one of the actors. However, it cannot be prevented in full. The participants have been made clear in advance of this.

Construct Validity

The questions asked should only measure that what it is intended to measure. We chose a semi-structured interview as a method, so there is much room for free form answers from the interviewees. In order to validate the answers given, we will apply triangulation. Saunders et al. (2019, p. 218) describe triangulation as using more than one source of data and method of collection to confirm the validity/credibility/authenticity of research data, analysis and interpretation. In our study we will interview people in different positions withing the case study organisation. Also, we will use any form of documentation about the platform or its data governance to confirm the answers that are given. Also, giving the interviewees the questions in advance gives them time to prepare and prevent “do not know” answers as much as possible.

Finally, we will allow (key) informants to review a draft version of the report to validate that it correctly reflects their vision on the subject.

Internal Validity

Our research is setup to measure the way in which data governance is applied on a cloud platform within a single case organisation.

During the semi-structured interviews, the participants will be informed that any answers that they will give will be processed anonymously. That will help them to feel more secure in giving answers that might be considered political.

The researcher has a broad experience in working with cloud platforms and data governance environments and is able to interact with the interviewees on a subject matter level.

Also, applying triangulation as described under ‘Construct Validity’ will help enhance the internal validity.

External validity

Within our single case study, we have synthesized our theoretical model from existing literature. We will interview participants in a wide variety of roles and functions. We also provide background data to establish the context of study and detailed description of phenomenon in question to allow comparisons to be made. Lastly, we will provide analytical generalization by comparing the results of the case study to the developed theory in an analytical way.

Bias

Respondent bias

There might be a case of friendliness bias, it occurs when a respondent demonstrates a tendency to agree with and be positive about whatever the moderator presents. We will use a standardized question form for each respondent in order to minimize the difference in questioning between respondents (Sarniak, 2015).

Researcher bias

One of the longest-recognized and most pervasive forms of bias in research, confirmation bias occurs when a researcher forms a hypothesis or belief and uses respondents' information to confirm that belief. This takes place in-the-moment as researchers' judge and weight responses that confirm their hypotheses as relevant and reliable, while dismissing evidence that doesn't support a hypothesis (Sarniak, 2015). In order to minimize this bias, we will frequently re-evaluate answers and impressions from respondents.

4 RESULTS

4.1 CASE DESCRIPTION

Our selected case was semi large hospital in the Netherlands which (partly, see chapter 4.2) met the requirements as stated in the methodology section. As a Data Consumer it is actively involved with a Data Supplier and has contracted a System Integrator to take care of its BI environment. Together with the hospital itself that makes 3 autonomously managed organizations that participate on the same platform (See appendix D5 for a full case description).

Table 4 shows the list of respondents that have been interviewed, together with the role in their own organisation as well as the role that their organisation has within the ecosystem. See appendix D1 for a complete overview of the respondents together with their determining answers.

#	Ecosystem role of organizations	Role of participant within their own organisation	Work experience	Education
1	Data Consumer	Head of BI Department	15 years	University
2	Data Consumer	Head of IT Infrastructure	20 years	HBO
3	Data Consumer	Architect	20 years	HBO
4	Data Supplier	Technical Analyst	9 years	Bachelor
5	Data Supplier	Research Strategist	14 years	Bachelor
6	System Integrator	Chief Technology Officer	13 years	University
7	System Integrator	Senior BI Consultant	20 years	University

TABLE 4 : LIST OF RESPONDENTS WITH PERSONAL AND ORGANISATIONAL ROLE

4.2 CASE LIMITATIONS

The selected case organisation did meet the selected requirements except that it currently has not deployed its BI environment on a cloud platform yet but is intending to in the next 2-3 years. Although this fact limits the results from this research because there is no hands-on experience on this matter within the hospital, the knowledge does exist with employees from the Data Supplier and System Integrator organisations. They have worked with cloud-based platform ecosystems for other, similar, customers. Both parties in this case are working with nearly half of the Dutch hospitals.

4.2.1 LIMITATIONS DUE TO COVID-19

Due to current restrictions around COVID-19 we were not able to conduct the interviews as planned. The interviews were held in an online setting via Microsoft Teams and recorded in that environment as well. The consent form was submitted to the respondents on forehand, but most respondents chose to verbally give consent during the meeting. Because of the characteristics of videoconferencing we were not able to assess the respondents body language or their surroundings.

4.3 DATA ANALYSIS

In this chapter we will analyze the answers for each part of the interview. Appendix D6: interview summaries contain the summarized results for each interview and Appendix D7: Results details contains the aggregated results for each individual question.

4.3.1 OPENING QUESTIONS

In the introduction part of the interviews we asked the following question:

“In your opinion what are important elements of data governance in a cloud environment ecosystem? Why? Could you give an example?”

Below in Table 5 you can find the answers to this question.

respondent	answer
DS-1	If the service provided by the cloud platform comes with a preferred information standard. And a key part of the data governance process would be mapping to that standard.
DS-2	Mostly similar to non-cloud environments. Consistent documentation and communication. Enforcing them in an environment with a different type of control will change, but elements will remain the same.
DC-1	Very clear agreements. Insight into data flows. Ownership. Responsibility. Such as, for example, with a data breach. Guaranteeing security and privacy. Security / authorization
DC-2	Security
DC-3	Security & Privacy.
SI-1	Timeliness, validity, validity. But we are also seeing auditability and traceability and also ownership of data. Stewardship and responsibility.
SI-2	Security. In a hospital context. Certainly from the point of view of user acceptance. Hospitals do have some concerns about data in the cloud.

TABLE 5: ANSWERS TO OPENING QUESTION

We have taken these responses and tried to match them with the elements in our framework and determined if these were relevant for our study and if so, in what theme and element it can be found (see Table 6). We found that “insight into data flows”, “authorization”, “privacy”, “timeliness”, ”validity”, ”auditability” and ”traceability” can be relevant for governing the platform but its usefulness is mainly for the Data Consumer role within the ecosystem. This should be researched further in a future study before adding it to the framework. “Security” however is a valid element and should be placed under Cloud Governance.

Proposed element by respondent	in proposed framework?	theme	element
Preferred information standard	yes	Data Governance	Process, Procedure & Policy
Consistent documentation and communication	yes	Data Governance	Process, Procedure & Policy
Very clear agreements.	yes	Ecosystem Governance	trust and participation of stakeholders
Insight into data flows	no		
Ownership	yes	Ecosystem Governance	decision making
Responsibility	yes	Data Governance	roles & responsibility
Security	no	Cloud Governance	
Authorization	no		
Privacy	no		
Timeliness	no		
Validity	no		
Auditability	no		
Traceability	no		
Stewardship	yes	Data Governance	roles & responsibility

TABLE 6: PROPOSED ELEMENTS BY RESPONDENTS

4.3.2 General questions

The responses taken from the 7 interviews were transcribed and the responses about the framework were analysed using Deductive Explanation Building method. We used Excel to first make a list of all the codes we found for our proposed framework (see chapter 2.3) and then added a column for each respondent, inserting their responses for each code. As described in paragraph 3.3, all answers given were transformed to one of the values in Table 7, for analysis purposes.

AGGREGATION	CODED ANSWER	MEANING	CONVERTED VALUES
POSITIVE	Yes	Fully agree	*Yes; Mandatory; Absolutely*
	Yes, but	Conditionally agree	*Yes, but*
NEGATIVE	Maybe	Agree only in certain cases / uncertain	*Maybe; less so*
	No	Do not agree	*No*

TABLE 7: CODING OF ANSWERS OF RESPONDENTS

Next, we analysed the results per question related to the governance element from our theoretical framework (See Table 8). During the interviews it became clear that question nr 7 consisted of 2 separate components to which the respondents reacted differently. We have split these results into question 7A and 7B to make a better distinction between the answers and will discuss this further in chapter 5. See appendix D4 for the complete list of coded questions.

	TOTAL				AGGREGATED	
Q. nr.	Yes	Yes, but	Maybe	No	positive	negative
1	6	0	0	1	6	1
2	6	0	0	1	6	1
3	5	2	0	0	7	0
4	6	0	0	1	6	1
5	6	0	0	1	6	1
6	6	1	0	0	7	0
7a	7	0	0	0	7	0
7b	5	0	1	1	5	2
8	2	4	0	1	6	1
9	7	0	0	0	7	0
10	6	0	0	1	6	1
11	5	0	1	1	5	2
12	7	0	0	0	7	0
13	5	0	0	2	5	2
14	7	0	0	0	7	0
15	7	0	0	0	7	0
16	6	1	0	0	7	0
17	7	0	0	0	7	0
18	3	1	1	2	4	3
19	1	6	0	0	7	0
20	6	0	1	0	6	1

TABLE 8: SUMMARY OF INTERVIEW ANSWERS

We can see from the results in Table 8 that:

- For 10 questions (3,6,7a,9,12,14,15,16,17,19) all respondents agree with the relevance of the governance elements and these should therefore be included in the intended framework.
- 6 questions (7a,9,12,14,15,17) are in unconditional agreement amongst all respondents

- There is no question where all respondents think it should not be included
- In response of 4 questions (7b,11,13,18) 2 or more respondents responded negatively
- In response of question 8 and 19 most respondents made conditional remarks

We have included the analysis of the responses to each individual question in Appendix D7: Results details.

4.4 PRACTICAL FRAMEWORK

Based on the results of the case study we have modified the proposed framework. The majority of the dimensions and mechanisms were agreed on by the respondents, but some modifications have been made. In summary we noticed that the pricing mechanism of the platform did not seem to have much relevance on the ecosystem level, but more on the platform level. Most respondents agreed that pricing will influence the decisions that have to be made, but that the Data Consumer will be impacted the most. Therefor this mechanism will be placed under Cloud Governance in the framework. Also under the Cloud Governance dimension the mechanism of financial objectives was removed, because although most respondents agreed that financial objectives (question 7b, as discussed before) of an organization are important when migrating to cloud in general, it seemed not to be relevant in the scope of this platform ecosystem. The security mechanism was also added to this dimension, based on the responses in the opening questions.

The mechanism Tools & Measurements has been removed from the framework because respondents found that to be too implicit to be part of a framework, although agreeing to the relevance of it in practice. Tools and measurements will be instated on the platform as seen fit by the ecosystem participants in each specific case. That would leave ‘API availability as a stand-alone dimension’ and therefor we moved it to General.

That makes the practical framework as follows (modifications opposed to the proposed framework marked in green, removals in red):

Governance dimension	Governance mechanisms	Governance element	Remark
Ecosystem Governance	Decision making	Authority	
	Trust and participation of stakeholders	Activie participation	
		Decision making method	
		SLA	
		Transparency and openness	
Cloud Governance	cloud general	Business objectives	
		Financial objectives	*Removed*
		Cloud deployment model	
		Cloud specific roles	
		Pricing	*Moved here because of respondent feedback*
		Training	
		Security	*Added based on opening questions*
Data Governance	General	Data governance decisions	
		Management support	
		API availability	*moved to General for grouping purposes*
		Transparency and accountability	
	Roles & Responsibility	Roles	
		Responsibilities	
		Stakeholder collaboration	
	Process, Procedure & Policy	Process, Procedure & Policy	
		standardization, documentation and repeatability	
	Tools & Measurement		Removed

Table 9: Concluding framework

5 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 DISCUSSION- REFLECTION

In this chapter we will reflect on the case study and the results of our interviews. We summarize the responses to the opening and closing questions and we will provide an interpretation of the empirical findings, following the design science approach. Finally, we will reflect on the validity and reliability of our research and provide a conclusion and recommendations.

5.1.1 CASE STUDY

Our single case study was done in a data platform ecosystem that has plans to migrate to a cloud environment in the next 2-3 years. Although the Data Supplier and System Integrator within this ecosystem also work for other customers in other ecosystems that do have enabled cloud platforms, the stakeholders for this ecosystem do not have this experience. It can be expected however that the mentioned parties can use that experience to assess the validity of our framework.

The relation between the different actors in the ecosystem is a customer-supplier relationship. This means that Data Supplier and System Integrator are dependent of Data Consumer as a customer by contract. However, the services that both suppliers provide are provided in the form of a template that is implemented for other customers as well. That means that any changes to that template requested by one of their customers will affect the other customers as well. Based on this we did not expect any bias towards their customer on forehand. So, we can assume that this relationship did not have a negative impact on the results of our study.

The situation in which the supplier has multiple customers for the same product or service, entails that the supplier can act on multiple ecosystems in multiple roles. For their own service, they see themselves as the platform owner and their customers as platform users. During the interviews with stakeholders from Data Supplier and System Integrator we noticed some ambiguity in the answers and in those cases, we asked them to stay focussed on the specific ecosystem in this case.

For the interviews we aimed for 9 different respondents (3 from each ecosystem actor), but due to circumstances only 7 respondents were available for conducting interviews. 9 interviews would of course have brought more perspectives to each actors view of the ecosystem, but since we were able to interview at least 2 people from each actor multiple perspectives from different actors are included in our study and the results are sufficient to validate the framework.

We submitted the consent form and question list to the respondents 1 day before the interview to give the interviewees a chance to prepare themselves. We decided to do this only 1 day in advance to prevent the participants to become ‘over-prepared’ and thus eliminating the chance for an open discussion. This worked out as planned, however some respondents doubted if they were the right person for the interview, based on those questions. There were concerns about the level of detailed knowledge that was necessary by the interviewees. But after we reassured them that the interview was about the ecosystem and not about technical details, the interviews could continue. After the interview the people involved concurred that it indeed was not too technical for them.

As the interviews were taken online, we recorded it in Microsoft Teams and deleted the video’s after processing the data. As said, the consent form was shared with all participants and some e-mailed a signed copy back where others consented verbally during the interview. We anonymised the data by removing the names and companies of all participants, only keeping a reference aside for ourselves. That reference will not be shared.

5.1.2 INTERPRETATION OF THE EMPIRICAL FINDINGS

In this study we developed a framework which contains the elements needed to govern a platform-as-a-service ecosystem in a cloud environment. Although limited research has been done, by conducting a systematic review, we selected nine studies focusing on the subjects of ecosystem governance, cloud governance or data governance to make a framework that could assist organizations that plan on moving to a cloud platform ecosystem or are already on it, but need to calibrate their environment. We performed a case study and used the method of interviews to validate the model. In this chapter we discuss our findings by comparing them with the expectations derived from the theory (chapter 2)

In the article by Schreieck (2017) *ownership status* is mentioned as a mechanism for platform governance and that the platform owner is legitimized by ownership and by his market power. Although that in a Platform-as-a-service environment the platform owner itself does not participate in the ecosystem, it does have a role to play. Our respondents seem to make a distinction between the technical side of the platform and the contents that reside on it. The latter is where our ecosystem exists, and the research made clear that the primary ownership of the platform (content wise) lies with the hospital (data consumer). But we found mixed signals as to how these decisions were to be made. Some adhered to a more authoritarian model wherein the hospital would drive the decision-making process, in order to prevent situations where consensus needs to be found amongst all parties. Others opted for the creation of a governance group where all parties had a say, and their argumentation was that all parties in the ecosystem have some kind of impact on the platform that others need to be aware of. The hospital pays the bill and decides to hire (or dismiss) the other parties within the ecosystem. That seems obvious, but some remarks were made that not all decision power lies with the hospital. When other parties contribute to the ecosystem, it is because of their specific expertise. And within that expertise lie their decision rights. That is especially the case when the hospital purchases an application or product that is used by the vendor for multiple customers. That particular case can be seen as an ecosystem on its own and the possible conflict of interest that may arise in multi-layer ecosystems is not part of this research. The three building blocks to characterize digital platform ecosystems mentioned by the study of Hein et al. (2019) (Platform ownership, Platform value-creating mechanisms, Complementor autonomy) are confirmed by our research.

On the other hand all respondents are in agreement that *SLA's* are needed in a cloud ecosystem, in accordance with the article by Al-Ruithe (2019) who named SLA's pivotal for data governance in cloud environments in which cloud consumers access data which they no longer directly control. That would strengthen the argument that the hospital is not in charge of alle aspects of the platform and agreements should be made to provide clarity to all parties involved. In addition to that, all respondents agree that there should be an element involved that discusses processes, procedures and policies. In the article by Abraham (2019) is stated that procedural governance mechanisms aim to ensure that data is recorded accurately, held securely, used effectively, and shared appropriately and that it contains data strategy, policies, standards, processes, procedures, contractual agreements, performance measurement, monitoring, issue management and compliance. So, taking into consideration that an SLA is set up between a service provider and a service receiver (and therefor a customer-supplier relationship) there seems to be a mixed message from the respondents between the theoretical authority of the platform and the practical implications of it. This contradiction could be a subject for further investigation.

Schreieck (2017) mentioned *boundary resources* (such as API's) to the platform are needed to enable developer access. Although that particular article focussed on the differences of boundary resources between commercial and non-profit platforms, the necessity of API's is evident as all respondents in our study confirm it. As Schreieck mentioned, API's on commercial platforms, like Platform-as-a-Service environments, are standardized and available on the technical side of the platform. That makes the availability of API's independent from the choice of platform. But, as said before, the ecosystem in our research is implemented on top of the technical platform and within that context API's may be used to interchange data between actors in the ecosystem. We found that on a cloud platform more elements can be treated as a black box and it is advisable to know in advance any limitations there might be.

Prasad (2013) proposed *governance structures* that could be implemented in a cloud environment for managing cloud resources (Chief cloud office, cloud management committee, cloud service facilitation center and cloud relationship center). In our research we found that 5 respondents did not believe that these roles should be specifically implemented, but that the new responsibilities will be handled within the existing team. All respondents agree that managing cloud resources is a new trade compared to an on-premise environment and that it's inevitable it should be given the proper attention. But necessarily in roles specific for cloud environments. Prasad (2013) also mentioned that the aforementioned cloud governance structures would contribute to the cloud business objectives and financial objectives. In our study we found that there were different responses for each type of objectives. Related to the business objectives, all respondents believed this to be relevant for the framework, because of the operational nature of the decision to move to the cloud and the impact that has on business objectives. However, it remains unclear if these objectives should be created and maintained together with the other actors within the ecosystem, or that it is a matter for each individual organisation and that conflicts of objectives may occur as a result.

With regards to "who pays the bill" we also investigated the *pricing* component of cloud platforms. This component significantly differentiates between cloud and on-premise platforms (hardware vs. services) and is one of the important reasons why companies migrate to cloud environments. Our research showed that all respondents wanted to see this element included in the framework. When you see costs as a result of the choices made on the cloud platform, then the owner (i.e. the hospital) is charged with the costs and no other party in the ecosystem is involved. On the other hand, working together with other parties on the same platform will have consequences on the choices made on the platform (which service is used, at what scale) with costs as an implication. The hospital turns up for the costs, but it is intertwined with platform functionality. The majority of the respondents do not separate those two. The respondents do however see pricing as part of cloud governance instead of ecosystem governance as mentioned by Schreieck (2017).

Al-Ruithe (2019) considered top level management support to be the critical success factor for implementing data governance. In our research we found that 2 respondents (from the hospital) did not want to include the element in the framework and their answers made it clear that they just need to have some level of trust from their board. Perhaps there are some political aspects of decision-making processes in a hospital that are influencing their responses in this, because the other respondents do see the relevance of involving top level management for the purpose of getting support. They think that the impact of transforming to a cloud environment is of such magnitude that involving upper management is needed and even essential for pushing through if a deadlock may occur.

Organizations can find themselves in a vendor lock-in when they want to switch from one application to another but need to transport the data between both applications and find out it is not that simple. Much time and money are lost in that process. This subject of Data Interoperability was mentioned by a few respondents during the interviews of their own accord. Data Interoperability allows the owner of the data to move data out from an application and into a new one, without question of ownership. By being able to tackle this subject on forehand, surprise costs can be prevented. In this case study the data supplier is part of the ecosystem, but also holds all the data. It is now unclear if an exit strategy exists.

5.1.3 REFLECTION ON OPENING AND CLOSING QUESTIONS OF THE INTERVIEWS

In both the opening questions (*which elements should be part of the framework?*) as well as the closing questions (*which element did we miss?*) "Security" was mentioned as a valid element. This element can be related to the platform as well as to Data, but since data security is also handled at the platform, the element should be placed under Cloud Governance. We suggest further research, by following the second design-evaluation cycle, provides a further empirical validation for this, and once validated add this subject into the framework.

Other elements that were mentioned on forehand were "insight into data flows", "authorization", "privacy", "timeliness", "validity", "auditability" and "traceability". And other elements that were mentioned in the closing question were "harmonizing data", "case related governance", "patients' perspective", "data masking", "data security", "privacy" and "physical location of data".

Many of those can be relevant for governing data within a single organization but should be further researched in a future study for their relevancy in an ecosystem framework.

5.1.4 DESIGN SCIENCE METHOD, FOLLOW UP

In chapter 3 we chose the Design Science method by Peffers (2007). After performing our single case study and analyzing the results, we chose not to iterate back to the design phase (because of time limitations of this project), but to give recommendations for future studies. In that way the proposed framework could be modified based on the discussions in this study, and empirically validated again in a new case study, or potentially have further refinement.

5.2 REFLECTION ON VALIDITY AND RELIABILITY

As discussed in chapter 4.2 our case organization is not yet active on a cloud platform, so it is limited in the degree to which accurate answers could be given. The organization is currently orienting on becoming active on a cloud platform and has partners within the case ecosystem that already have experience with this at other customers. Therefor the results are a mixture of experience and expectations. The descriptions in Table 2 were not presented to the interviewees during the interview, therefor they could have had a different concept of the definition of each question. This might be a risk to the validity of the research. After the first interview we noticed that the respondents needed a better understanding of the definitions and so we included a verbal explanation for each topic in the upcoming interviews. Also, whenever an interviewee still had a different interpretation of a question, we provided a further explaination about what we mean by that question (including the first interview).

In the context of validity and reliability, the following steps have been taken:

- Restrictive reporting is applied in this research. Due to the evaluative nature of this research, a single case study is used. The disadvantages of this is that the results can be generalized to a limited extent, resulting in a negative impact on external validity.

- In our selection process for finding respondents we asked for a wide variety of scope of employees that have different roles within the organisation. By conducting the interviews among various employees, we received answers from different angles that have enriched the results.
- Because of the employees with various backgrounds, not all respondents were experts on all fields in the interview. For example, respondent DC-2 had limited knowledge about the subject of Data Governance, because of the line of work as Manager Infrastructure.
- By conducting the interviews in sequential order, we were able to identify points for improvement in the first interview that could be used to improve the second interview and so on. Based on this process, the quality of the interviews improved in the course of time.
- All interviews have been transcribed for reference, the recorded videos have been deleted for privacy and the compacted answers for each respondent have been extracted from the transcriptions. Each answer form has been sent to the corresponding respondent for verification. No negative feedback or corrections have been received.
- We have coded the responses with the terms we found during the literature research
- Due to COVID-19 restrictions all interviews were conducted remotely by using Microsoft Teams. Although interviewer and interviewee were able to see each other, non-verbal nuances may have been missed that may have led to different interview dynamics if it were face to face, with a potential different outcome as a result. This is, unfortunately, a fact of life at this point in time.

5.3 CONCLUSIONS

The possible services that can be created in a PaaS ecosystem are widespread and a result of the collaboration between strategic partners, complementors and consumers. Governance on platforms requires a delicate balance of control between the platform contributors (Hein, 2019) and if multiple parties are involved in creating value on a cloud platform, it's the question in which way each party will take responsibility. Data governance in such an environment will play an entirely different role than in non-cloud environments.

The objective of this study was to design and validate a data governance framework of a digital platform ecosystem in cloud environments. With regards to our research sub-questions we conclude the following:

5.3.1 WHAT ARE THE CURRENT GOVERNANCE FRAMEWORKS IN THE CLOUD PLATFORM ECOSYSTEMS LITERATURE?

In our literature review we selected 8 articles to be used as a foundation of our research. We selected the main themes from each article and used that to base our proposed framework on.

- A framework for governing nonprofit platform ecosystems (Schreieck, 2017)
- Four possible IT governance structures for cloud computing (Prasad, 2013).
- A Security Governance Framework for Cloud Computing (Rebollo, 2014)
- A model of key dimensions for cloud data governance (Al-Ruithe, 2019)
- An analysis of data governance activities (Alhassan, 2016)
- A conceptual framework for data governance (Abraham, 2019)
- Critical success factors for data governance (Alhassan, 2019)
- A cloud data governance research model (Al-Ruithe, 2020)
- Overall taxonomies of data governance for cloud (Al-Ruithe, 2019)

The following themes were derived from the literature review process: Ecosystem governance, Cloud governance, Data governance and its subthemes Roles & responsibilities; Process, Procedure & Policy and Tools & Measurement

5.3.2 What are the dimensions and mechanisms that characterize digital platform governance?

After assessing the titles, a total of 119 articles, we were able to eliminate 84 of them. The remaining articles were examined by the abstract and the remaining 21 articles were examined in full and selected based on their contents regarding either cloud-, platform- or data governance. That resulted in 9 usable articles.

From these articles we derived the following themes: Cloud governance, Security Governance, Platform Governance, Ecosystem Governance and Data Governance. Within Data Governance we found the following sub-themes: Cloud vs. Non-Cloud, Decision Domains, Scoping (Data, Domain, Organizational), Critical Success Factors and Enabling Factors. To integrate these terms into a framework, we stated the following sub-question:

5.3.3 How can this information be integrated into a theoretical framework?

From our literature review process, we were able to derive the following themes: Ecosystem governance, Cloud governance, Data governance. Within those themes we found 7 dimensions: (1)decision making, (2)trust and participation of stakeholders, (3)cloud general, (4)data governance general, (5)Roles & responsibilities; (6)Process, Procedure & Policy and (7)Tools & Measurement.

After this integration we wanted to know if the proposed framework could be validated in a practical situation.

5.3.4 How can the information in the framework be validated in practice?

We validated the framework by performing a single case study at a medium sized hospital in the Netherlands who works together with 2 of its partners form an ecosystem around their data platform. We consider this ecosystem as a selected case. Within this ecosystem, we held 7 semi-structured interviews with eligible persons from all 3 companies in the ecosystem and asked them 20 main questions about the validity of each element and followed that up with a discussion to gain their reasoning and argumentation . In that way we were able to get in-depth answers from the respondents. Besides those questions we asked 2 opening questions and 3 closing questions to let the respondents think about the framework from their own perspective and not that of our research.

Since this is a single case study in a healthcare environment in the Netherlands, the results may not be generalizable outside of that context. Although the results are generalizable to other cases with a similar setting, Healthcare service providers work with sensitive data and can have a more rigorous look on how to handle that data than companies in other fields of business.

5.3.5 How can the framework be refined with practical information?

As a result of our case study we found that although the element of security within dimension Cloud Governance was not included in the framework, it does seem to be a valid element for the framework. There were some doubts if the cloud governance structure should be related to financial objectives and if the element of pricing on the cloud platform should be part of the framework. Furthermore, respondents found it hard to make a distinction between transparency on the ecosystem level and transparency on the data governance level. Respondents found the element “transparency and accountability” within the theme “data governance” confusing when compared to “transparency and openness” on the “ecosystem governance” theme.

Data Interoperability is connected to an exit strategy to be able to change between solution providers, system integrators or the cloud platform itself. Being able to access and transport your own data is an element that perhaps needs to be included in the framework after further investigation

We recommend further research, by following the second design-evaluation cycle, provide a further empirical validation for these, and then decide to add them into the framework, once validated.

5.4 RECOMMENDATIONS FOR PRACTICE

Although the responses received indicate that there is room to further refine and improve the framework, all respondents acknowledge that having such a framework is useful in daily practice. It contains the basic elements needed for a leading organization (like the hospital) to effectively start and coordinate the discussion between themselves and other participants in their ecosystem when initiating moving to a cloud platform. The framework can also assist currently cloud-active ecosystems who wish to challenge or benchmark the current situation and start discussions where need may be.

We can say that, keeping in mind the limitations, our framework can be used as a control mechanism for organizations that intend to make a transformation to a cloud platform or are already on it.

5.5 RECOMMENDATIONS FOR FURTHER RESEARCH

In the first cycle of design, this research has been conducted in an ecosystem between a hospital, a data supplier and a system integrator, that have not yet migrated to a cloud platform. That limitation is perhaps the most obvious subject for further research: to conduct this research with the same composition but already working on a cloud platform together. Besides that, another interesting research subject could be an ecosystem of organisations on a cloud platform that are not healthcare related. In a hospital environment there might be more emphasis and regulation on privacy of (patient) data than in another industry, which might lead to a different outcome.

During the interviews several respondents made remarks about the scope of the ecosystem. They gave insight on their view of ‘ecosystems on top of ecosystems’, with 2 distinct instances:

1. The hospital is in an ecosystem together with multiple hospitals or other healthcare organizations (e.g. general practitioners). In that environment there would be a shift in authority because there would be no distinct ‘lead’ organization and the focus would be on sharing patient data.
2. The Data Supplier delivers its software to multiple hospitals and is in contact with all of them about new features and changes to existing features. They have a responsibility to all parties and will most likely not entertain all individual wishes from its customers to prevent instability in its software.

In the case where these 2 types of ecosystems exist simultaneously with the ecosystem case in this study a conflict of interest might occur. This can be further researched.

The way in which a leading organization could create an exit strategy from the cloud platform or one of its components, would be a valid subject to study further. The article by Rebollo (2014) describes a method concerning cloud service termination as part of the security governance process. We did not include this element because of our focus on building up the environment, but regarding the remarks given during the interviews this might have been an element to include. However, to include it into the framework, its relevance should be further investigated in future studies .

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APPENDIX A1: LITERATURE REVIEW PROCESS

Selection results

Year of publication	Step 1	Step 2	Step 3	Step 4
2009	1	1	0	0
2010	1	1	0	0
2012	5	0	0	0
2013	2	0	0	0
2014	10	3	1	1
2015	7	2	2	1
2016	8	3	1	1
2017	9	7	5	1
2018	31	3	3	1
2019	37	13	8	3
2020	8	2	1	1
Total	**119**	**35**	**21**	**9**

Table 1: literature selection process results

Selection Details

Description	Jaar	Article Nr	stage 2	stage 3	stage 4	data governance	cloud governance	platform governance	Ecosystem governance	author
On governance structures for the cloud computing services and assessing their effectiveness	2014	1	1	1	1	0	yes	0	0	door Prasad, Acklesh; Green, Peter; Heales, Jon
Evolutionary Competition in Platform Ecosystems	2015	2	0	0	0	0	0	0	0	door Tiwana, A
Platform governance for sustainable development: Reshaping citizen-administration relationships in the digital age	2018	3	0	0	0	0	0	0	0	door Janowski, Tomasz; Estevez, Elsa; Baguma, Rehema
THE ECOSYSTEM OF SOFTWARE PLATFORM: A STUDY OF ASYMMETRIC CROSS-SIDE NETWORK EFFECTS AND PLATFORM GOVERNANCE	2018	4	1	1	0	0	0	yes	yes	door Song, PJ; Xue, L; Rai, A; More...
Seeing without knowing: Limitations of the transparency ideal and its application to algorithmic accountability	2018	5	0	0	0	0	0	0	0	door Ananny, Mike; Crawford, Kate
Democratising platform governance in the sharing economy: An analytical framework and initial empirical insights	2017	6	1	0	0	0	0	yes	0	door Martin, Chris J; Upham, Paul; Klapper, Rita
Does Platform Owner's Entry Crowd Out Innovation? Evidence from Google Photos	2018	7	0	0	0	0	0	0	0	door Foerderer, Jens; Kude, Thomas; Mithas, Sunil; More...
Sharing Economy, Sharing Responsibility? Corporate Social Responsibility in the Digital Age	2019	8	0	0	0	0	0	0	0	door Etter, Michael; Fieseler, Christian; Whelan, Glen
An Internet of ownership: Democratic design for the online economy	2018	9	0	0	0	0	0	0	0	door Schneider, Nathan
Does Platform Owner's Entry Crowd Out Innovation? Evidence from Google Photos	2018	10	0	0	0	0	0	0	0	door Foerderer, J; Kude, T; Mithas, S; More...
Human-Machine Collaboration for Content Regulation: The Case of Reddit Automoderator	2019	11	0	0	0	0	0	0	0	door Jhaver, Shagun; Birman, Iris; Gilbert, Eric; More...
Smart cities in the new service economy: building platforms for smart services	2014	12	0	0	0	0	0	0	0	door Anttiroiko, Ari-Veikko; Anttiroiko, Ari-Veikko; Valkama, Pekka; More...
The collaborative realization of public values and business goals: Governance and infrastructure of public–private information platforms	2016	13	0	0	0	0	0	0	0	door Klievink, Bram; Bharosa, Nitesh; Tan, Yao-Hua

Knowledge boundaries in enterprise software platform development: Antecedents and consequences for platform governance	2019	14	1	1	0	0	0	yes	yes	door Foerderer, Jens; Kude, Thomas; Schuetz, Sebastian Walter; More...
Network effects on crowdfunding platforms: Exploring the implications of relaxing input control	2018	15	0	0	0	0	0	0	0	door Thies, Ferdinand; Wessel, Michael; Benlian, Alexander
Mapping the knowledge domain and the theme evolution of appropriability research between 1986 and 2016: a scientometric review	2018	16	0	0	0	0	0	0	0	door Sun, Yaowu; Zhai, Yi
Technology facilitated coercive control: domestic violence and the competing roles of digital media platforms	2018	17	0	0	0	0	0	0	0	door Dragiewicz, Molly; Burgess, Jean; Matamoros-Fernández, Ariadna; More...
When Does a Platform Create Value by Limiting Choice?	2014	18	0	0	0	0	0	0	0	door Casadesus-Masanell, Ramon; Hałaburda, Hanna
Co-Creating Platform Governance Models Using Boundary Resources: a Case Study from Dementia Care Services	2019	19	1	1	0	0	0	yes	0	door Farshchian, Babak A; Thomassen, Hanne Ekran
A fog computing based concept drift adaptive process mining framework for mobile APPs	2018	20	0	0	0	0	0	0	0	door Huang, Tao; Xu, Boyi; Cai, Hongming; More...
Platform heterogeneity, platform governance and complementors' product performance: an empirical study of the mobile application industry	2019	21	0	0	0	0	0	0	0	door Yi, Jingtao; He, Jinqiu; Yang, Lihong
How Empowering Is Citizen Science? Access, Credits, and Governance for the Crowd	2019	22	0	0	0	0	0	0	0	door Chen, Shun-Ling
What is platform governance?	2019	23	1	0	0	0	0	yes	0	door Gorwa, Robert
ISGcloud: a Security Governance Framework for Cloud Computing	2015	24	1	1	1	0	yes	0	0	door Rebollo, O; Mellado, D; Fernandez-Medina, E
Successfully Governing Software Ecosystems: Competence Profiles of Partnership Managers	2019	25	0	0	0	0	0	0	0	door Kude, Thomas; Huber, Thomas; Dibbern, Jens
Algorithmic content moderation: Technical and political challenges in the automation of platform governance	2020	26	1	0	0	0	0	yes	0	door Gorwa, R; Binns, R; Katzenbach, C
PLATFORM COSMOLOGIES: enabling resituation	2019	27	0	0	0	0	0	0	0	door Reed, Patricia
The collaborative realization of public values and business goals: Governance and infrastructure of public-private information platforms	2015	28	0	0	0	0	0	0	0	door Klievink, A.J; Bharosa, N; Tan, Y

A process perspective on platform design and management: evidence from a digital platform in health care	2019	29	0	0	0	0	0	0	0	door Fürstenau, Daniel; Auschra, Carolin; Klein, Stefan; More...
Toward Fragmented Platform Governance in China: Through the Lens of Alibaba and the Legal-Judicial System	2019	30	0	0	0	0	0	0	0	door Hong, Y; Xu, J
Governing nonprofit platform ecosystems - an information platform for refugees	2017	31	1	1	1	0	0	yes	yes	door Schreieck, Maximilian; Wiesche, Manuel; Krcmar, Helmut
A systematic literature review of data governance and cloud data governance	2019	32	1	1	1	yes	yes	0	0	door Al-Ruithe, Majid; Al-Ruithe, Majid; Benkhelifa, Elhadj; More...
archivist: An R Package for Managing, Recording and Restoring Data Analysis Results	2017	33	0	0	0	0	0	0	0	door Biecek, P; Kosinski, M
AI4People—An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations	2018	34	0	0	0	0	0	0	0	door Floridi, Luciano; Cowls, Josh; Beltrametti, Monica; More...
Survey on Access Control for Community-Centered Collaborative Systems	2018	35	0	0	0	0	0	0	0	door Paci, Federica; Squicciarini, Anna; Zannone, Nicola
Data governance activities: an analysis of the literature	2016	36	1	1	1	yes	0	0	0	door Alhassan, Ibrahim; Sammon, David; Daly, Mary
A Crisis of Opportunity: Market-Making, Big Data, and the Consolidation of Migration as Risk	2020	37	0	0	0	0	0	0	0	door Taylor, Linnet; Meissner, F.V.M
Data governance: A conceptual framework, structured review, and research agenda	2019	38	1	1	1	yes	0	0	0	door Abraham, Rene; Schneider, Johannes; vom Brocke, Jan
A Data Governance Maturity Evaluation Model for government departments of the Eastern Cape province, South Africa	2019	39	1	0	0	yes	0	0	0	door Olaitan, Olutoyin; Herselman, Marlien; Wayi, Ntombovuyo
An integrated data analytics process to optimize data governance of non-profit organization	2019	40	1	0	0	0	0	0	0	door Wang, Chen-Shu; Lin, Shiang-Lin; Chou, Tung-Hsiang; More...
Better governance, better access: practising responsible data sharing in the METADAC governance infrastructure	2018	41	0	0	0	0	0	0	0	door Murtagh, Madeleine J; Blell, Mwenza T; Butters, Olly W; More...
Data Governance of Irish Food	2016	42	1	0	0	yes	0	0	0	door Costello, Jim
Embedding AI and Crowdsourcing in the Big Data Lake	2014	43	0	0	0	0	0	0	0	door O'Leary, Daniel E
Data work in context: Value, risks, and governance	2018	44	0	0	0	0	0	0	0	door Foster, Jonathan; McLeod, Julie; Nolin, Jan; More...
The role of ethics in data governance of large neuro-ICT projects	2018	45	0	0	0	0	0	0	0	door Stahl, BC; Rainey, S; Harris, E; More...

Data governance case at KrauseMcMahon LLP in an era of self-service BI and Big Data	2017	46	1	1	0	yes	0	0	0	door Riggins, Frederick J; Klamm, Bonnie K
Changes in roles, responsibilities and ownership in organizing master data management	2019	47	0	0	0	0	0	0	0	door Vilminko-Heikkinen, Riikka; Pekkola, Samuli
Health data use, stewardship, and governance: ongoing gaps and challenges: a report from AMIA's 2012 Health Policy Meeting	2014	48	0	0	0	0	0	0	0	door Hripcsak, G; Bloomrosen, M; FlatelyBrennan, P; More...
Critical Success Factors for Data Governance: A Theory Building Approach	2019	49	1	1	1	yes	0	0	0	door Alhassan, Ibrahim; Sammon, David; Daly, Mary
MAMD 2.0: Environment for data quality processes implantation based on ISO 8000-6X and ISO/IEC 33000	2017	50	0	0	0	0	0	0	0	door Carretero, Ana G; Gualo, Fernando; Caballero, Ismael; More...
The impact of digital technologies on point-of-care diagnostics in resource-limited settings	2018	51	0	0	0	0	0	0	0	door Gous, N; Boeras, DI; Cheng, B; More...
The Datafication of Everything — Even Toilets	2018	52	0	0	0	0	0	0	0	door Lun, Kwok-Chan
The future of statistics and data science	2018	53	0	0	0	0	0	0	0	door Olhede, Sofia C; Wolfe, Patrick J
Digital health: meeting the ethical and policy challenges	2018	54	0	0	0	0	0	0	0	door Effy, V; Tobias, H; Afua, A; More...
Identifying Useful Approaches to the Governance of Indigenous Data	2019	55	0	0	0	0	0	0	0	door Bruhn, Jodi
We need to think about data governance for dementia research in a digital era	2020	56	0	0	0	0	0	0	0	door Milne, Richard; Brayne, Carol
Towards an Underground Utilities 3D Data Model for Land Administration	2019	57	0	0	0	0	0	0	0	door Yan, Jingya; Jaw, Siow; Soon, Kean; More...
Requirements for cloud-based BIM governance solutions to facilitate team collaboration in construction projects	2017	58	1	1	0	0	yes	0	0	door Alreshidi, Eissa; Alreshidi, Eissa; Mourshed, Monjur; More...
The development of large-scale de-identified biomedical databases in the age of genomics-principles and challenges	2018	59	0	0	0	0	0	0	0	door Dankar, FK; Ptitsyn, A; Dankar, SK
Big data governance of personal health information and challenges to contextual integrity	2019	60	0	0	0	0	0	0	0	door Winter, Jenifer Sunrise; Davidson, Elizabeth
Tracking progress in suicide prevention in Indigenous communities: a challenge for public health surveillance in Canada	2018	61	0	0	0	0	0	0	0	door Pollock, Nathaniel J; Healey, Gwen K; Jong, Michael; More...
What's behind the ag-data logo? An examination of voluntary agricultural-data codes of practice	2018	62	0	0	0	0	0	0	0	door Sanderson, Jay; Wiseman, Leanne; Poncini, Sam

First Nations data sovereignty in Canada	2019	63	0	0	0	0	0	0	0	door Centre
Better governance, better access: practising responsible data sharing in the METADAC governance infrastructure	2018	64	0	0	0	0	0	0	0	door Murtagh, MJ; Blell, MT; Butters, OW; More...
Modeling and Visualizing Smart City Mobility Business Ecosystems: Insights from a Case Study	2018	65	0	0	0	0	0	0	0	door Faber, Anne; Rehm, Sven-Volker; Hernandez-Mendez, Adrian; More...
Clinical research data warehouse governance for distributed research networks in the USA: a systematic review of the literature	2014	66	1	0	0	0	0	yes	0	door Holmes, JH; Elliott, TE; Brown, JS; More...
Determining the enabling factors for implementing cloud data governance in the Saudi public sector by structural equation modelling	2020	67	1	1	1	yes	yes	0	0	door Al-Ruithe, Majid; Benkhelifa, Elhadj
A new hat for librarians: providing REDCap support to establish the library as a central data hub	2018	68	0	0	0	0	0	0	0	door Read, K; LaPolla, FWZ
Data governance, data literacy and the management of data quality	2016	69	0	0	0	0	0	0	0	door Koltay, Tibor
Virtualization of open-source secure web services to support data exchange in a pediatric critical care research network	2015	70	0	0	0	0	0	0	0	door Frey, Lewis J; Sward, Katherine A; Newth, Christopher JL; More...
Responsible Data Governance of Neuroscience Big Data	2019	71	0	0	0	0	0	0	0	door Fothergill, BT; Knight, W; Stahl, BC; More...
Collection and Governance of Data: Much to Learn	2014	72	1	0	0	0	0	0	0	door White, Jerry P
Towards model governance in predictive toxicology	2013	73	0	0	0	0	0	0	0	door Palczewska, Anna; Fu, Xin; Trundle, Paul; More...
Thinking ethical and regulatory frameworks in medicine from the perspective of solidarity on both sides of the Atlantic	2016	74	0	0	0	0	0	0	0	door Prainsack, Barbara; Buyx, Alena
A risk based model for quantifying the impact of information quality	2014	75	0	0	0	0	0	0	0	door Borek, Alexander; Parlikad, Ajith Kumar; Woodall, Philip; More...
Perceptions of the uses of routine general practice data beyond individual care in England: a qualitative study	2018	76	0	0	0	0	0	0	0	door Wyatt, David; Cook, Jenny; McKevitt, Christopher
Governing self service analytics	2016	77	0	0	0	0	0	0	0	door Clarke, Paul; Tyrrell, Grace; Nagle, Tadhg
"Technology Readiness and Acceptance Model" as a Predictor for the Use Intention of Data Standards in Smart Cities	2018	78	0	0	0	0	0	0	0	door Buyle, R; Van Compernolle, M; Vlassenroot, E; More...
The Electronic Data Methods (EDM) Forum for Comparative Effectiveness Research (CER)	2012	79	0	0	0	0	0	0	0	door Erin Holve; Courtney Segal; Marianne Hamilton Lopez; More...

Informatics and data quality at collaborative multicenter Breast and Colon Cancer Family Registries	2012	80	0	0	0	0	0	0	0	door McGarvey, PB; Ladwa, S; Oberti, M; More...
Data governance activities: a comparison between scientific and practice-oriented literature	2018	81	1	1	0	yes	0	0	0	door Alhassan, Ibrahim; Sammon, David; Daly, Mary
One Size Does Not Fit All---A Contingency Approach to Data Governance	2009	82	1	0	0	yes	0	0	0	door Weber, Kristin; Otto, Boris; Österle, Hubert
Quality of Open Research Data: Values, Convergences and Governance	2020	83	0	0	0	0	0	0	0	door Koltay, Tibor
Users' perceptions of Data as a Service (DaaS)	2016	84	1	0	0	0	0	0	0	door Solberg Søilen, Klaus
Towards a Fuzzy Expert System on Toxicological Data Quality Assessment	2013	85	0	0	0	0	0	0	0	door Yang, Longzhi; Neagu, Daniel; Cronin, Mark T. D; More...
EXPERIENCE: Succeeding at Data Management-BigCo Attempts to Leverage Data	2016	86	0	0	0	0	0	0	0	door Aiken, Peter
Data governance in the sustainable smart city	2017	87	1	1	0	yes	0	0	0	door Paskaleva, K; Evans, J; Martin, C.J; More...
EDM Forum Supplement Overview	2012	88	0	0	0	0	0	0	0	door Ned Calonge
Graph based data governance model for real time data ingestion	2015	89	1	1	0	yes	0	0	0	door Dutta, Hiren
Data Governance Taxonomy: Cloud versus Non-Cloud	2018	90	1	1	1	yes	0	0	0	door Al-Ruithe, M; Benkhelifa, E; Hameed, K
Managing and exploiting routinely collected NHS data for research	2012	91	0	0	0	0	0	0	0	door Curcin, Vasa; Soljak, Michael; Majeed, Azeem
Fit for purpose? The GDPR and the governance of European digital health	2020	92	0	0	0	0	0	0	0	door Marelli, Luca; Lievevrouw, Elisa; Van Hoyweghen, Ine
The Promise of Participation and Decision-Making Power in Citizen Science	2019	93	0	0	0	0	0	0	0	door Eleta, Irene; Galdon Clavell, Gemma; Righi, Valeria; More...
Data Donation as a Model for Citizen Science Health Research	2019	94	0	0	0	0	0	0	0	door Bietz, Matthew; Patrick, Kevin; Bloss, Cinnamon
Data Governance, Consumer Privacy, and Project Status Reporting: Remembering H. Jeff Smith	2019	95	0	0	0	0	0	0	0	door Keil, M; Culnan, M; Dinev, T; More...
Toward a data governance model for the Kenya health professional regulatory authorities	2017	96	1	0	0	yes	0	0	0	door Were, Victor; Moturi, Christopher
Constructing a Public Narrative of Regulations for Big Data and Analytics: Results From a Community-Driven Discussion	2020	97	0	0	0	0	0	0	0	door Popham, James; Lavoie, Jennifer; Coomber, Nicole

Indigenous Data Governance: Strategies from United States Native Nations	2019	98	1	0	0	yes	0	0	0	door Carroll, Stephanie Russo; Rodriguez-Lonebear, Desi; Martinez, Andrew
Product-level profitability Current challenges and preconditions for data-driven, fact-based product portfolio management	2020	99	0	0	0	0	0	0	0	door Hannila, H; Koskinen, J; Harkonen, J; More...
Factors for effective BIM governance	2017	100	1	1	0	yes	yes	0	0	door Alreshidi, Eissa; Mourshed, Monjur; Rezgui, Yacine
The “We” in the “Me”: Solidarity and Health Care in the Era of Personalized Medicine	2018	101	0	0	0	0	0	0	0	door Prainsack, Barbara
Business information architecture for successful project implementation based on sentiment analysis in the tourist sector	2019	102	0	0	0	0	0	0	0	door Zapata, Gianpierre; Murga, Javier; Raymundo, Carlos; More...
Data Usage and Access Control in Industrial Data Spaces: Implementation Using FIWARE	2018	103	0	0	0	0	0	0	0	door Munoz-Arcentales, Andres; López-Pernas, Sonsoles; Pozo, Alejandro; More...
A Framework for Big Data Governance to Advance RHINs: A Case Study of China	2019	104	1	1	0	yes	0	0	0	door Li, Quan; Lan, Lan; Zeng, Nianyin; More...
City Data Plan: The Conceptualisation of a Policy Instrument for Data Governance in Smart Cities	2019	105	0	0	0	0	0	0	0	door Lupi, Lucia
Critical success factors for data governance: a telecommunications case study	2019	106	1	1	0	yes	0	0	0	door Alhassan, Ibrahim; Sammon, David; Daly, Mary
The Impact of Sustainable Financial Data Governance, Political Connections, and Creative Accounting Practices on Organizational Outcomes	2019	107	0	0	0	0	0	0	0	door Ababneh, Tha’er Amjed Mahmoud; Aga, Mehmet
Business Intelligence Competency Center: Improving Data and Decisions	2015	108	0	0	0	0	0	0	0	door Foster, Kyle; Smith, Gregory; Ariyachandra, Thilini; More...
Data Governance and Sovereignty in Urban Data Spaces Based on Standardized ICT Reference Architectures	2019	109	0	0	0	0	0	0	0	door Cuno, Silke; Bruns, Lina; Tcholtchev, Nikolay; More...
Big data analytics: The case of the social security administration	2014	110	0	0	0	0	0	0	0	door Krishnamurthy, Rashmi; Desouza, Kevin C
Analysis of Data Management in Blockchain-Based Systems: From Architecture to Governance	2019	111	1	0	0	yes	0	0	0	door Paik, Hye-Young; Xu, Xiwei; Bandara, H. M. N. Dilum; More...
An Investigation into Data Management as a Strategic Information Tool and Its Importance at the Durban University of Technology	2014	112	0	0	0	0	0	0	0	door Francis, Ramani; Jinabhai, D C; Dorasamy, N

Advancing good governance in data sharing and biobanking - international aspects	2019	113	1	1	0	yes	0	0	0	door Fernando, Buddhika; King, Mandella; Sumathipala, Athula
Digital Medicine: A Primer on Measurement	2019	114	0	0	0	0	0	0	0	door Coravos, Andrea; Goldsack, Jennifer C; Karlin, Daniel R; More...
~~Datos abiertos: : oportunidades para la transformación social y digital en Venezuela~~	~~2019~~	~~115~~	~~0~~	~~0~~	~~0~~	0	0	0	0	~~door Sandoval, Franklin~~
Managing the business benefits of product data management: the case of Festo	2012	116	0	0	0	0	0	0	0	door Otto, Boris
Enterprise vocabulary management A lexicographic view	2015	117	0	0	0	0	0	0	0	door Voskuil, Jan
Free the Data!: E-Governance for Megaregions	2010	118	1	0	0	yes	0	0	yes	door Curtin, Gregory G
Designing a Platform for Ethical Citizen Science: A Case Study of CitSci.org	2019	119	0	0	0	0	0	0	0	door Lynn, Stacy J; Kaplan, Nicole; Newman, Sarah; More...

Table 1: Literature selection rationale details

APPENDIX A2: RESULTS OF LITERATURE SYNTHESIS

	Ecosystem Organisation	Cloud governance	Data governance	Roles & Responsibilities	Process, Procedure, Policy	Tools & Measurement
[1] Prasad (2013) On governance structures for the cloud computing services and assessing their effectiveness		Governance structures for managing cloud resources: Chief cloud office, cloud management committee, cloud service facilitation centre and cloud relationship centre. These structures should relate to cloud business objectives and financial objectives				
[31] Schreieck (2017): Governing nonprofit platform ecosystems an information platform for refugees	Transparency, Trust building, Openness, Ownership status. The overall governance structure can be centralized or decentralized, which accounts for the distribution of decision rights. Enhance trust and reduce perceived risk In most platform ecosystems, the mechanism of pricing is relevant	A platform ecosystem needs to be open to a certain degree, but openness needs to be accompanied by control mechanisms to avoid uncoordinated effort hindering cocreation of value. In commercial platform ecosystems, standardized boundary resources such as documentation, tutorials, APIs and SDKs facilitate the onboarding of a large number of complementors			Boundary resources such as standardized application programming interfaces (APIs) to enable developers to access the platform
[49] Alhassan (2019) Critical Success Factors for Data Governance - A Theory Building Approach			Have the right data requirements and comply with regulations.Increase employee awareness and training. Consider data as a strategic element and management reinforcement of this ethos.	Assign a committee for data governance and define the data owners	Have appropriate data processes and procedures and embed them into the systems. Embed data policies into the systems.	
[38] Abraham (2019) Data governance - A conceptual framework, structured review, and research agenda	Antecedents: Legal and regulatory requirements have an impact on the business use and control of data. Creating awareness, ensuring active participation of stakeholders. inter-organizational scope for data governance between firms or an ecosystem of firms, companies should be aware of loss of control on data, unsecured information access, and low-quality information products. Set up data integration and usage policies to prevent this		data governance is attributed to improving data quality due to increased accuracy, availability, completeness, consistency, and timeliness of data and the limitation of errors due to data inconsistencies. Data governance reduces these risks by creating risk-mitigating policies and introducing controls for monitoring compliance. there are 6 main data decision domains: (a) data quality; (b) data security; (c) data architecture; (d) data lifecycle; (e) meta data; (f) data storage and infrastructure 2 types of categories for data: traditional data (master data, transactional data, reference data) and big data (velocity, variety, volume).	Structural governance mechanisms determine reporting structures, governance bodies, and accountabilities. Relational governance mechanisms facilitate collaboration between stakeholders. They encompass (i) communication; (ii) training; and (iii) the coordination of decisionmaking.	Procedural governance mechanisms aim to ensure that data is recorded accurately, held securely, used effectively, and shared appropriately A centralized corporate approach in business and IT facilitates data governance adoption	measuring data governance effectiveness as the ratio of the number of preventive data quality management measures to the total number of data quality management measures conducted.
[32] Al-Ruithe (2019) A systematic literature review of data governance and cloud data governance		Cloud actors refer to a person or an organization that participates in processes or a transaction. In cloud environments, data is no longer under direct control of the consumer, so service level agreements (SLA) between cloud consumer and provider is needed. There are 4 types of cloud deployment models: public, private, hybrid, and community.	Activities in the data governance function can be considered as master activities for implementing DG; they result in responsibilities, processes and procedures. The data governance structure contains roles that are needed to collaborate to formulate data governance elements. Top level management support is essential and legal factors should be included in the DG design.	Organizations must clearly specify roles and responsibilities for cloud actors, because of their special status		having measuring and monitoring tools in place to ensure data meets business rules. Increase reliability of the DG process.
[67] Al-Ruithe (2020) Determining the enabling factors for implementing cloud data governance in the Saudi public sector by structural equation modelling	organisational strategy, technical strategy, environment strategy, business strategy, corporate governance, IT governance,cloud governance and other strategies offers. Negotiation between the cloud consumer and provider related to cloud data governance, and develop the cloud data governance level agreement	integrate with cloud deployment models, and integrate with cloud service delivery models. identify the critical success factors, education and training plan, execute change management plan, and execute cloud data governance change plan	defining the DG requirements before launching the formal programme is important.		important processes and procedures that should be considered to identify the cloud data governance requirements before implementing its programme. The cloud data governance office is responsible for its design.	develop metrics and key performance indicators (KPIs) to measure cloud data governance, and develop cloud data governance tool based on modern technology. The cloud data governance office is responsible for determining the requirements and critical success factors.
[90] Al-Ruithe (2018) Data Governance Taxonomy Cloud versus Non-Cloud	DG will have Influence on stakeholders in data-related decisions and actions, so people and organisational bodies play an important role.	Cloud computing offers potential benefits by making IT services available as a commodity: Cloud Deployment models, Service Delivery model, Service level Agreement	The data governance team must define all data governance policies that address cloud consumer's concerns Effective DG requires transparency and accountability	Organizations must include sepcific cloud actors on implementation of cloud data governance and specify roles and responsibilities	Processes should be standardized, documented and repeatable.DG policies describe methods to govern data.	for DG all incoming and existing data should meet business rules. Monitor SLA compliance
[24] Rebollo (2014) ISGcloud - a Security Governance Framework for Cloud Computing		Perform a security risk assessment to identify threats and mitigiate vulnarabilities. (1) Planning/Strategy Definition; (2) Cloud Security Analysis; (3) Cloud Security Design; (4) Cloud implementation / Migration; (5) Secure Cloud Operation and (6) Cloud Service Termination		The governance activities require the active involvement of senior officers, the participant roles at every managerial level need to be involved in the framework		regular measurement and reporting of progress and detected issues. the definition of metrics with which to evaluate the security of services

APPENDIX B – LITERATURE REVIEW

General information

Nr. of article	1
Title of article	On governance structures for the cloud computing services and assessing their effectiveness
Authors	Prasad, Acklesh; Green, Peter; Heales, Jon
Year of publication	2014

Relevance & review questions

Subject	Possible answers	Answer	Argumentation
Are the research objectives close to our own?	Yes / No	Yes	Their objectives are to supply 4 different governance structures for managing the cloud computing resources and make a relation business and financial objectives.
Is the context like our own?	Yes / No	Yes and No	Their context is about governance of cloud implementations, but they make no connection with platforms or ecosystems
Has the article been subject to a reviewing process prior to publication?	Yes / No	Yes	One of the filters in our search was peer-reviewed articles. All the found articles thus have been subject to a peer-review.
Does the article provide guidance for future research?	Yes / No	Yes	The article provides a suggestion for future research
Does the item contain any characteristics of cloud platform governance?	Yes / No	Yes	The implementation in cloud environments and the additional challenges that brings, is a relevant addition to our research
Does the item contain any characteristics of data governance?	Yes / No	No	The article does not reference data governance
Does the item contain any characteristics of ecosystems?	Yes / No	No	The article does not reference ecosystems

Governance characteristics

Governance dimension	Mechanisms / activities	Description	Main findings	Metho dology
Roles & Responsibility	Chief Cloud Officer	a chief cloud officer to initiate potential cloud service acquisition. Actual and potential cloud service sourcing organizations perceive that this structure contributes to achieving cloud-based business objectives as it would bring relevant cloud resources on the decision making table.	This capacity mimics the role of the Chief Technology Officer, but in a cloud intensive environment. A CCO would assist the organization with cloud brokerage and suggesting extras, as most cloud providers will provide the basic. A CCO would also manage aspects of technical governance	
	Cloud management committee	a cohesive committee to decide on the cloud proposals. This committee would steer the adoption of cloud services with consideration from different management group.	Cloud management committee (CMC) relates to bringing together different levels of management and other stakeholders to oversee the adoption of cloud services. As cloud computing adoption continues to grow, the ability to govern the services used will be a critical success factor.	
	Cloud service facilitation	actual and potential cloud service sourcing organizations perceive that a cloud service facilitation committee would contribute to achieving cloud-based business objectives.	Cloud Service Facilitation (CSF) relates to operational management of cloud services in organizations. The main resource within this structure will be the Cloud Service Manager (CSM). The CSM will deal with the economics of cloud, which will include cloud provider risk assessment, and enterprise agreements.	
	Cloud Relationship management	We suggested that a governance structure in the form of cloud relationship management would ensure the continuity of cloud initiatives, and would also be the end user source of	A Cloud Relationship Centre (CRC) would be a cloud governance structure dealing with relationship management. The task of this center would include ensuring continuous relationship between IT and	

		future cloud service requirements.	business, communication of cloud related security, architecture standards and business unit compliance.	

General information

Nr. of article	24
Title of article	ISGcloud: a Security Governance Framework for Cloud Computing
Authors	Rebollo, O; Mellado, D; Fernandez-Medina, E
Year of publication	2015

Relevance & review questions

Subject	Possible answers	Answer	Argumentation
Are the research objectives close to our own?	Yes / No	Yes	Although only specific to one aspect of data governance, the development of an information security framework is related to our work.
Is the context like our own?	Yes / No	Yes	Cloud and security
Has the article been subject to a reviewing process prior to publication?	Yes / No	Yes	One of the filters in our search was peer-reviewed articles. All the found articles thus have been subject to a peer-review.
Does the article provide guidance for future research?	Yes / No	Yes	Deployment of the framework in a case study
Does the item contain any characteristics of cloud platform governance?	Yes / No	Yes	
Does the item contain any characteristics of data governance?	Yes / No	Yes	Only security
Does the item contain any characteristics of ecosystems?	Yes / No	No	

Governance characteristics

Governance dimension	Mechanisms / activities	Description	Main findings	Method-ology
Legal	define SLA and legal contracts	Successful security governance is achieved through an appropriate translation of the organization's security requirements into agreements with its cloud provider in order to manage and minimize risks	Like any outsourcing service, cloud computing services need adequate SLAs to be properly managed.	
	Cloud service termination	This task includes the steps needed to guarantee a secure service termination and information retrieval from the cloud provider, whether the service is transferred to another provider or is eventually discarded	Developing a termination report with useful information for successive iterations. Some of the initial tasks from the next cycle are greatly simplified by additionally considering the newly discovered risks.	
Security	Specify cloud service monitoring and auditing	The organization defines the processes and metrics needed to perform security audits based on the previously defined SLAs	specifies the conditions under which the cloud service will be monitored	
	Define applicable security control	Based on the risk analysis, the organization must develop the security measures that it will apply both during the cloud service operation and also in cases of incidents or major disasters	Based on the risk analysis, the organization must develop the security measures that it will apply both during the cloud service operation and also in cases of incidents or major disasters	
	Cloud security operation	The security operation task reflects the successive iterations of the governance cycle	Prioritization of the programmes and the regular reporting of security issues, which may include recommendations for corrective and preventive actions.	
	Communicate information	This task reflects the continuous communication process	continuous communication process that takes place within	

	security within the organization	that takes place within the organization in order to maintain security awareness and permit the extension of new policies	the organization in order to maintain security awareness	
Roles & Responsibilities	Establish Information Security roles and responsibilities	The security design requires a detailed establishment of responsibilities within the organization	Designate the ownership of information assets within the organization	

General information

Nr. of article	31
Title of article	Governing nonprofit platform ecosystems - an information platform for refugees
Authors	Schreieck, Maximilian; Wiesche, Manuel; Krcmar, Helmut
Year of publication	2017

Relevance & review questions

Subject	Possible answers	Answer	Argumentation
Are the research objectives close to our own?	Yes / No	Yes	Developing a governance strategy for an informational platform ecosystem, although for the non-profit sector
Is the context like our own?	Yes / No	Yes and No	Governance and platform ecosystems, but not specifically in a cloud environment
Has the article been subject to a reviewing process prior to publication?	Yes / No	Yes	One of the filters in our search was peer-reviewed articles. All the found articles thus have been subject to a peer-review.
Does the article provide guidance for future research?	Yes / No	Yes	Testing social platforms and the implementation of collaboration aspects
Does the item contain any characteristics of cloud platform governance?	Yes / No	No	
Does the item contain any characteristics of data governance?	Yes / No	Yes	
Does the item contain any characteristics of ecosystems?	Yes / No	Yes	Concerning the delivery of information to refugees by various suppliers

Governance characteristics

Governance dimension	Mechanisms / activities	Description	Main findings	Methodology
platform governance	Goverrnance structure	Decentralized governance in order to incentivize volunteers and to handle decentralized information structure	Balance centralization against shared pricing	
	Accessibility and control	Open platform with free access for information providers	Centralized, formal control . Legitimation by ownership and market power	
	Trust	Build trust in sustainability of the project	Trust in platform technology and owner . Focus on reliability and continuance	
	boundary resources	Resources distributed by team members on an individual basis.	Standardized boundary resources . Focus on documentation and tools	

General information

Nr. of article	32
Title of article	A systematic literature review of data governance and cloud data governance
Authors	door Al-Ruithe, Majid; Benkhelifa, Elhadj; More...
Year of publication	2019

Relevance & review questions

Subject	**Possible answers**	**Answer**	**Argumentation**
Are the research objectives close to our own?	Yes / No	Yes and no	It is mainly about data governance, but only in the form of a SLR.
Is the context like our own?	Yes / No	Yes and No	This article is a literature review to find what has been written about traditional data governance versus cloud data governance, but makes no reference to ecosystems
Has the article been subject to a reviewing process prior to publication?	Yes / No	Yes	One of the filters in our search was peer-reviewed articles. All the found articles thus have been subject to a peer-review.
Does the article provide guidance for future research?	Yes / No	Yes	focus on developing a holistic framework for cloud data governance strategy
Does the item contain any characteristics of cloud platform governance?	Yes / No	Yes	It focusses on both cloud and non-cloud environments
Does the item contain any characteristics of data governance?	Yes / No	Yes	The focus is on providing guidance on future research on data governance
Does the item contain any characteristics of ecosystems?	Yes / No	No	

Governance characteristics

Governance dimension	Mechanisms / activities	Description	Main findings
Standards	Cloud deployment model	it is the important factor that considers in the data governance. There are primarily four cloud deployment models that differ in risk and concern about control and security and contractual barriers. That are public, private, hybrid, and community. To address data governance, the level of risk and complexity of each cloud deployment must be taken into consideration	private, public, hybrid, and community model
Standards	Service delivery model	cloud services can be categorized into three delivery models; software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS). Depending on the model, the cloud consumer loses control on their data, since the cloud provider has responsibility to manage some components in these model. Therefore, the data governance teams have to consider all characteristics of the service delivery model, and define appropriate policies to enforce control roles and responsibilities	software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS)
Roles & Responsibilities	Cloud actors	they are also a critical factor into data governance for the cloud services. Cloud actors refer to a person or an organization that participates in processes or a transaction, and/or performs tasks in cloud computing environment. NISTs cloud computing reference architecture distinguishes five major actors: the cloud consumer, the cloud provider, the cloud auditor, the cloud carrier, and the cloud broker [9]. All of the aforementioned have special roles and responsibilities in the cloud, so the data governance teams must clearly define the roles and responsibilities for all cloud actors	Cloud actors refer to a person or an organization that participates in processes or a transaction, and/or performs tasks in cloud computing environment.

Standards	Service Level Agreement (SLA)	One key issue for the cloud consumer is the provision of governance for data which it no longer directly controls [127]. Contractual barriers increase between cloud actors. A SLA is an agreement that serves as the foundation of expectation for service(s) between the cloud consumer and the provider. The agreement states what services will be provided, how they will be provided, and what happens if the expectations are not met. Therefore, SLA is pivotal in data governance. Thus, the cloud consumer and provider have to negotiate all aspects of data governance before developing the SLA. As a result, these agreements are in place to protect both Parties	One key issue for the cloud consumer is the provision of governance for data which it no longer directly controls. Contractual barriers increase between cloud actors
Policies & Processes	Data governance function	this refers to master activities for data governance, including functions which data governance teams have to take in account when implementing data governance programs. The outcomes from data governance function activities include policies, principles, processes, decision rights, roles and responsibilities, communication plans, and change management. This is considered the master dimension for data governance, nonetheless, it must comply with other dimensions to develop an effective data governance	this refers to master activities for data governance, including functions which data governance teams have to take in account when implementing data governance programs
Roles & Responsibilities	Data governance structure	Designing data governance structure is an important factor in ensuring that requisite roles and responsibilities are addressed throughout the enterprise at the right organizational levels [28]. Several common data governance roles have been identified in existing studies, including the following: executive sponsor, data governance council, data governance office, chief	Designing data governance structure is an important factor in ensuring that requisite roles and responsibilities are addressed throughout the enterprise at the right organizational levels

		steward, business and technical data steward [3, 7]. These roles have to collaborate to formulate data governance bodies	
Roles & Responsibilities	Organizational	organizational factors are important for data governance to be successful [30]. Data governance requires change management in the organization, in addition to the participation and commitment of IT staff, business management, and senior-level executive sponsorship in organizations [3]. Moreover, top management support is considered as the critical success factor for implementing data governance [28]. Staff in organizations needs to learn data governance functions, demanding top management support to enhance an organization staffs' skillset	Data governance requires change management in the organization, in addition to the participation and commitment of IT staff, business management, and senior-level executive sponsorship in organizations
Standards	Technical	Technology is also a key element for data governance success [36]. Therefore, lack of technology considers common barriers to successful data governance. Technical factors encapsulate data management issues that affect organizations' strategies such as security, privacy, quality, and integrity. As such, it is incumbent upon organizations which anticipate to implement data governance, to assess all technological characteristics available at the organizations, to effectively implement data governance	Technical factors encapsulate data management issues that affect organizations' strategies such as security, privacy, quality, and integrity. Organizations which anticipate to implement data governance should assess all technological characteristics available
Standards	Environmental	environmental factors refers to external environmental considerations such as government legislation and data protection act [101]. The data governance teams have to consider all environmental aspects when designing data governance functions. This means that data	The data governance teams have to consider all environmental aspects when designing data governance functions. This means that data governance functions have to comply with government

		governance functions have to comply with the environments. This consideration immensely contributes towards building strong data governance in the organization	legislation and data protection act
Standards	Measuring and monitoring tool	measuring and monitoring supports ongoing data governance efforts to ensure that all incoming and existing data meets business rules [37]. By adding a monitoring component to data governance program, data quality efforts are enhanced, which in turn renders data much more reliable [26]. As mentioned above, the above six dimensions are common when implementing data governance for cloud or traditional IT; however, they differ in their implementations. Table 11 is an attempt to show some of these differences	By adding a monitoring component to data governance program, data quality efforts are enhanced, which in turn renders data much more reliable

General information

Nr. of article	36
Title of article	Data governance activities: an analysis of the literature
Authors	Alhassan, Ibrahim; Sammon, David; Daly, Mary
Year of publication	2016

Relevance & review questions

Subject	**Possible answers**	**Answer**	**Argumentation**
Are the research objectives close to our own?	Yes / No	No	It focusses only on data governance through a SLR
Is the context like our own?	Yes / No	Yes	DG is the main part of our context
Has the article been subject to a reviewing process prior to publication?	Yes / No	Yes	One of the filters in our search was peer-reviewed articles. All the found articles thus have been subject to a peer-review.
Does the article provide guidance for future research?	Yes / No	Yes	validation by conducting field studies
Does the item contain any characteristics of cloud platform governance?	Yes / No	No	
Does the item contain any characteristics of data governance?	Yes / No	Yes	
Does the item contain any characteristics of ecosystems?	Yes / No	No	

Governance characteristics

Governance dimension	Mechanisms / activities	Description	Main findings	Methodology
Decision domains	Data Principles	No description given	No findings relating to content	
	Data lifecycle	No description given	No findings relating to content	
	Data Quality	No description given	No findings relating to content	
	Data access	No description given	No findings relating to content	
	Metadata	No description given	No findings relating to content	
Area of Governance	Data roles and responsibilities	No description given	No findings relating to content	
	Data policies	No description given	No findings relating to content	
	Data processes and procedures	No description given	No findings relating to content	
	Data standards	No description given	No findings relating to content	
	Data strategy	No description given	No findings relating to content	
	Data technologies	No description given	No findings relating to content	
	Data guidelines	No description given	No findings relating to content	
	Data requirements	No description given	No findings relating to content	

General information

Nr. of article	38
Title of article	Data governance: A conceptual framework, structured review, and research agenda
Authors	Abraham, Rene; Schneider, Johannes; vom Brocke, Jan
Year of publication	2019

Relevance & review questions

Subject	**Possible answers**	**Answer**	**Argumentation**
Are the research objectives close to our own?	Yes / No	Yes and No	It provides a holistic view on data governance, but not in the context of cloud environments
Is the context like our own?	Yes / No	Yes and No	Only data governance
Has the article been subject to a reviewing process prior to publication?	Yes / No	Yes	One of the filters in our search was peer-reviewed articles. All the found articles thus have been subject to a peer-review.
Does the article provide guidance for future research?	Yes / No	Yes	Researchers should conduct a quantitative study to identify the correlations between antecedents, the scoping parameters, and data governance mechanisms. This could provide further insights on how to configure data governance in a specific environment
Does the item contain any characteristics of cloud platform governance?	Yes / No	No	
Does the item contain any characteristics of data governance?	Yes / No	Yes	
Does the item contain any characteristics of ecosystems?	Yes / No	No	

Governance characteristics

Governance dimension	Mechanisms / activities	Description	Main findings
Organizational Scope	Intra-organizational	Data governance on firm level	The intra-organizational scope determines data governance within a single organization. It comprises data governance on the project- or on firm-level
	Inter-organizational	Data governance between firms/ecosystem	The inter-organizational scope encompasses data governance between firms or even for an ecosystem of firms.
Data Scope	Traditional data	Master data	Master data describes the key business objects within an organization
		Transactional data	Transactional data represents records about business transactions in different domains
		Reference data	Reference data refers to an agreed-upon set of common values used throughout an organization
Domain Scope		Data Quality	Data quality refers to the ability of data to satisfy its usage requirements in a given context
		Data security	Data security refers to the preservation of security requirements concerning the accessibility, authenticity, availability, confidentiality, integrity, privacy, and reliability of data
		Data architecture	Data architecture comprises the definition of enterprise data objects
		Data lifecycle	Data lifecycle represents the approach of defining, collecting, creating, using, maintaining, archiving, and deleting data
		Meta data	Meta data is used to classify data sensitivity levels
		Data storage and infrastructure	Data storage and infrastructure focus on IT artifacts that enable effective data management across the organization
Governance mechanisms	Structural mechanisms	Roles and responsibilities	executive sponsor, data governance leader, data owner, data steward, data governance council, data governance office, data producer, and the data consumer
		Allocation of decision maker	The allocation of decision-making authority determines, which organizational unit has the mandate for action related to data governance
	Procedural mechanisms	Data strategy	This represents a high-level course of action based on strategic business objectives
		Policies, standards and processes	**Data policies** provide high-level guidelines and rules regarding the creation, acquisition, storage, security, quality, and permissible

			use of data. **Data standards** ensure that the data representation and the execution of data-related activities are consistent and normalized throughout the organization. Clear **data processes** are considered a fundamental element of a successful data governance implementation.
		Contractual agreements	such agreements are service level agreements (SLA) and data sharing agreements (DSA)
		Performance measurement	Performance measurement aims at assessing the effectiveness of data governance by measuring the level of goal attainment
		Compliance monitoring	Compliance monitoring aims at tracking and enforcing conformance with regulatory requirements and organizational policies, standards, procedures, and SLAs
		Issue management	Issue management refers to the identification, management, and resolution of data-related issues
	Relational mechanisms	Communication	Communication aims at continuously generating awareness for the data governance program among stakeholders
		Training	Training programs ensure that stakeholders have the necessary knowledge and qualifications to support the implementation of data governance
		Coordination of decision making	This describes practices for the alignment across functions

General information

Nr. of article	49
Title of article	Critical Success Factors for Data Governance: A Theory Building Approach
Authors	Alhassan, Ibrahim; Sammon, David; Daly, Mary
Year of publication	2019

Relevance & review questions

Subject	Possible answers	Answer	Argumentation
Are the research objectives close to our own?	Yes / No	Yes	It focusses on the success factors when implementing data governance
Is the context like our own?	Yes / No	Yes and No	Implementing data governance is an important part of our research, but in this article is no reference made to either cloud or ecosystems.
Has the article been subject to a reviewing process prior to publication?	Yes / No	Yes	One of the filters in our search was peer-reviewed articles. All the found articles thus have been subject to a peer-review.
Does the article provide guidance for future research?	Yes / No	Yes	Conducting further case studies in different industries is needed, in order to promote a "universal model" of CSFs for data governance
Does the item contain any characteristics of cloud platform governance?	Yes / No	No	
Does the item contain any characteristics of data governance?	Yes / No	Yes	
Does the item contain any characteristics of ecosystems?	Yes / No	No	

Governance characteristics

Governance dimension	Mechanisms / activities	Description	Main findings	Methodology
Critical success factors	Employee data competencies	Increase employee awareness and training to prevent Questionable employee competency level and top management awareness	Increase employee awareness and training	
	Clear data processes and procedures	Have appropriate data processes and procedures and embed them into the systems to prevent Significant manual data entry	Have appropriate data processes and procedures and embed them into the systems	
	Flexible data tools and technologies	Have appropriate IT infrastructure and integrated data to prevent Data integration and ability to embed data policies, processes, and procedures	Have appropriate IT infrastructure and integrated data.	
	Standardized easy-to-follow data policies	Embed data policies into the systems to prevent Lack of clear data policies	Embed data policies into the systems.	
	Established data roles and responsibilities	Assign a committee for data governance and define the data owners to prevent Unclear roles and responsibilities	Assign a committee for data governance and define the data owners.	
	Clear inclusive data requirements	Have the right data requirements and comply with regulations to prevent Understanding of data requirements and communication issues	Have the right data requirements and comply with regulations	
	Focused and tangible data strategies	Consider data as a strategic element and management reinforcement of this ethos to prevent Understanding the importance of the data	Consider data as a strategic element and management reinforcement of this ethos	

General information

Nr. of article	67
Title of article	Determining the enabling factors for implementing cloud data governance in the Saudi public sector by structural equation modelling
Authors	Al-Ruithe, Majid; Benkhelifa, Elhadj
Year of publication	2020

Relevance & review questions

Subject	Possible answers	Answer	Argumentation
Are the research objectives close to our own?	Yes / No	Yes	It aims to investigate the determining factors of cloud data governance implementation
Is the context like our own?	Yes / No	Yes	It focusses on the challenges for implementing data governance in cloud environments
Has the article been subject to a reviewing process prior to publication?	Yes / No	Yes	One of the filters in our search was peer-reviewed articles. All the found articles thus have been subject to a peer-review.
Does the article provide guidance for future research?	Yes / No	Yes	Future work will focus on developing a holistic framework for cloud data governance
Does the item contain any characteristics of cloud platform governance?	Yes / No	Yes	
Does the item contain any characteristics of data governance?	Yes / No	Yes	
Does the item contain any characteristics of ecosystems?	Yes / No	No	

Governance characteristics

Governance dimension	Mechanisms / activities	Description	Main findings
CDGO	Cloud data governance office	Consists of Cloud data governance structure, Roles and responsibilities and Communication plan	supported
PR	Preparation requirements	Business case, Asses, Cloud data governance requirements and Data classification	Supported
CDF	Cloud data governance functions	Policies, Processes, Procedures and Standards	Supported
CA	Contextual alignment	Organisational, technical, environment and business strategy, Corporate, IT and cloud governance. And other strategies offers	Supported
CI	Contextual integration	Integrate with cloud deployment models, Integrate with cloud service delivery models	Supported
CC	Contractual context	Negotiation between cloud consumer and provider, Develop the cloud data governance level agreement	Is supported by PR, CDF, CA and CI
DC	Deploy context	Configuring the cloud data governance program, Implementing the Cloud data governance program	Is supported by MR, CC and CDGO
SR	Sustain requirements	Identify the critical success factors, Education and training plan, Execute change management plan, Execute Cloud data governance change plan	Supported
MR	Monitor requirements	Develop metrics and kpi's to measure the Cloud data governance. Develop Cloud data governance tool based on modern technology	Supported

General information

Nr. of article	90
Title of article	Data Governance Taxonomy: Cloud versus Non-Cloud
Authors	door Al-Ruithe, M; Benkhelifa, E; Hameed, K
Year of publication	2018

Relevance & review questions

Subject	**Possible answers**	**Answer**	**Argumentation**
Are the research objectives close to our own?	Yes / No	Yes	The objectives are to determine the factors that need to be considered when implementing a data governance strategy for cloud computing services
Is the context like our own?	Yes / No	Yes	Although not in relation to an ecosystem
Has the article been subject to a reviewing process prior to publication?	Yes / No	Yes	One of the filters in our search was peer-reviewed articles. All the found articles thus have been subject to a peer-review.
Does the article provide guidance for future research?	Yes / No	Yes	Further research can investigate the application of the proposed taxonomies, especially for cloud data governance, in real world case scenarios.
Does the item contain any characteristics of cloud platform governance?	Yes / No	Yes	
Does the item contain any characteristics of data governance?	Yes / No	Yes	
Does the item contain any characteristics of ecosystems?	Yes / No	No	

Governance characteristics

Governance dimension	Mechanisms / activities	Description	Main findings	Method-ology
Cloud Data Governance	Data governance structure	Designing a data governance structure is an important factor in ensuring that requisite roles and responsibilities are addressed throughout the enterprise at the right organisational levels	Executive sponsorship Data management committee Compliance committee Data stewardship committee Cloud manager Cloud provider member IT member Legal member	
	Data governance function	This refers to master activities for data governance, including functions which data governance teams must take into account when implementing data governance programmes	Process Standard Principle Procedure	
	Cloud deployments model	This is an important factor to consider in data governance, there are primarily four cloud deployment models, which differ in their provisions	Public Private Hybrid Community	
	Service delivery model	Depending on the model, the cloud consumer will have a differing level of control over their data	IaaS PaaS SaaS	
Roles & Responsibility	Cloud Actors	Cloud actors refers to individuals or organisations that participate in processes or transactions, and/or perform tasks in the cloud computing environment	Cloud consumer Cloud provider Cloud auditor Cloud broker Cloud carrier	
	Service level agreement	One key issue for the cloud consumer is the provision of governance for data which they no longer directly control		
	Organisational	Data governance is a major mechanism for establishing control over an organisation's data assets and enhancing their business value	Organisation charts Organisation vision and mission Organisation strategy Business model	

			Decision making process Communication plan Training plan Change management plan	
	Technical	The technical context represents the issues related to data which will affect the decision of cloud computing adoption and data governance implementation for cloud computing services	Availability, Reliability, Security, Privacy, Quality, Ownership, Auditing, Integrity	
	Legal	The legal aspect in this context determines the external and internal laws and regulations related to the data which might affect an organisation's intent to adopt cloud technology	Data protection act, Change of control act, Cloud regulations	
	Monitor matrix	The monitor matrix in data governance is the exercise of authority, control and shared decision-making over the management of data assets	Cloud control matrix KPI's Monitoring tool	

APPENDIX C1: INTERVIEW PROTOCOL

This questionnaire is part of the thesis “Data governance in cloud platform ecosystems”

Definition > **CPE: Cloud Platform Ecosystem**

Introduction

The interview will start with a general introduction to explain the goal of the interview and the research objective. After this both interviewer as interviewee will briefly introduce themselves.

Opening questions

- What is your Educational level?
- Which department in your organization do you belong to?
- What is your Function (organizational position)?
- How many years of experience do you have in this position?
- How many years of work experience do you have in this industry?
- How would you describe the role of your organization in the platform ecosystem?
- In your opinion what are important elements of data governance in a cloud environment ecosystem? Why? Could you give an example?

Ecosystem Organisation

Decision making

Platform governance can be defined as the partitioning of decision-making authority between platform owners and app developers and control mechanisms. In a PaaS (Platform as a Service) environment, the platform owner is not part of the ecosystem.

1. In a PaaS CPE environment, should the framework include an element regarding decision authority? What would happen if it didn’t? Which party should be in the lead?

PaaS facilitates the development and deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers.

2. Do you think the pricing component of PaaS Environments should be a part of the CPE framework? Please elaborate.

trust and participation of stakeholders

From an ecosystem perspective, participants should adopt transparency and openness to enhance trust so perceived risk can be reduced.

3. Are transparency and openness relevant for a CPE framework? What do you think?
4. From the ecosystem perspective; Do you think active participation of stakeholders should be part of a CPE framework? Is this based on your own experience?

5. Should the way in which governance related decisions are made within the ecosystem (such as architectural or more operational decisions), be a part of a CPE framework? Why?

Setting up a SLA between CPE organizations is a more formal way of governing the environment; regarding our research subject this could be called a Cloud Data Governance Agreement (CDGA).

6. Do you think setting up a SLA or CDGA should be part of a CPE Framework? Why?

Cloud Governance

Organizations should have governance structures in the form of cloud actors in place for managing cloud resources and participating in cloud processes. These structures should relate to the organisation's cloud business objectives and indirectly to their financial objectives.

7. Regarding an organizations cloud business objectives and financial objectives; Do you think it should be part of a CPE framework? Why? Is this based on your own experience?
8. Do you think that having cloud specific roles in an organization should be part of a CPE framework?
9. Is it relevant to include the cloud deployment model in the framework (public, private, hybrid)? Why?
10. Do education and training of employees need to be included in a CPE framework? Why?

Data Governance

The data governance function can be considered as a collection of master activities for implementation of data governance. It introduces controls for monitoring compliance and reduces risks by creating risk-mitigating policies. Before launching the formal programme it is important for the organization to define the DG requirements and be transparent and accountable about it.

11. Data governance in a cloud platform ecosystem could be handled on the ecosystem level, or within the individual participating organizations. Do you think the decision should be part of a CPE framework? Do you have any experience on this matter?
12. Should the transparency and accountability of data governance be part of a CPE framework? How do you reason?
13. It is important that top-level management is providing support. Do you think that it should be included in this framework? Why? Can you provide examples?

Roles & Responsibility

Clearly specified roles and responsibilities of that roles will help actors within organizations to understand what is required from them.

14. Do you think that the roles within the CPE should be part of a CPE framework? Can you explain why?
15. Do you think that responsibility that go with these roles should be part of a CPE framework? Can you explain why?

To enable the collaboration between stakeholders, organizations can implement relational governance mechanisms to facilitate them. These mechanisms encompass communication, training and the coordination of decision making.

16. Do you think that governance mechanisms for stakeholder collaboration should be a part of a CPE framework? Why?

Process, Procedure & Policy

Processes, procedures and policies aim to ensure that data is recorded accurately, held securely, used effectively, and shared appropriately.

17. Do you think that elements of Processes, Procedures & Policies should be part of a CPE framework? Which elements? And can you explain why?
18. Do you think that the standardization, documentation and repeatability of CPE processes and procedures should be part of the framework? Why?

Tools & Measurement

To increase the reliability of the data governance process in a cloud environment, measurement is needed. It can be used for overall progress and detected issues, if incoming and existing data meets business rules and if SLA conditions are followed.

19. Do you think that tools & measurement should be part of an CPE framework? Can you explain why?
20. The availability of API's on a cloud platform are an important factor for developer interaction? Do you think it should be part of the CPE framework? Please explain.

Closing

- Do you think that we missed any governance mechanisms? If so, which?
- Do you think a framework is helpful in a cloud platform ecosystem? Why?
- Do you intend to use such a framework? Please explain.
- Do you find the interview useful for your cloud platform ecosystem? Why?

Thank the respondent for the time and confirm that any audio recording will be deleted after processing. An interview report will be sent so that the respondent can verify that everything has been correctly interpreted.

APPENDIX C2 - INFORMATION LETTER & CONSENT

The goal of this interview is to collect information about the validity of the framework for Cloud Platform Ecosystems (CPE) that was developed from existing theory and aimed at data governance in cloud platform ecosystems. The value of this framework is to aid practical implementations in this field by providing relevant subjects that organizations should take into account.

The information will be collected by interviewing different actors from the same ecosystem. By doing this we hope to collect data from different perspectives and thus create a complete picture of the validity of this framework in practice. This data will also be used to further refine the framework itself.

The interviews will take about 1,5 hours and will be held online, because of current Covid-19 regulations preventing face to face interviewing. With permission of the interviewee, the interview will be recorded for data processing reasons and the recordings will be deleted after processing has been completed. The result of the data processing will be shared with the interviewee afterwards, so it can be checked for any errors or missing parts.

Please note that any information that can point to the interviewee personally will be removed from the transcription and resulting analysis, making sure the respondents can give their answers in complete anonymity.

On the next page you can find a consent form in which we ask permission to use and analyze the given information for the purpose of completing the case study research.

Consent form

By completing and signing this form you formally give permission for the following statements. You can change or withdraw your consent at any time. If you intend to do so, please contact the researchers immediately.

Please give your consent to the statements below.

	Yes	**No**
I declare that I have the subject, themes of the interview and purpose of the research.		
I understand that participation in the interview is voluntary and that I have the right to end the interview at any time		
I agree to have the audio of this interview recorded, knowing that the recording will be deleted as soon as it takes effect is agreed.		
I consent to the use of analyzing the data generated during this interview, knowing that it is anonymous data.		
I consent to be quoted anonymously in the final report.		

Interviewee

Name:

Function:

Date:

Place:

_____

Signature:

APPENDIX D1: OVERVIEW OF RESPONDENTS

respondent	Educational level	deparment	Function	years of experience in function	years of experience in industry	role of organization in the platform ecosystem?	Important elements of data governance in a cloud environment ecosystem
DS-1	Bachelors degree	Analytics Implementation / data driven.	Research Strategist	10 years	14 years	Data Supplier. To help with the modeling of data and understanding of the meaning of the data. Making sure that it can be represented by an ontological standard.	A preferred information standard. And a key part of the data governance process would be mapping to that standard.
DS-2	Bachelor - Astronomy	Technical support	Technical analyst – strategic	6 years	9 years	Data Supplier. Our role depends on customer, it differs from hosting and providing technical support to providing pieces of the platform.	Mostly similar to non-cloud environments. Consistent documentation and communication. Enforcing them in an environment with a different type of control will change, but elements will remain the same.
DC-1	University	ICT	Head of BI	3 years	15 years	Customer In a customer-supplier relationship	Very clear agreements. Insight into data flows. Ownership. Responsibility. Guaranteeing security and privacy. Security / authorization
DC-2	Bachelor - Business Informatics	ICT	Head Operations	3 years	20 years	Customer. Service management.	Security
DC-3	Bachelor - HBO	Information management.	Technical Architect	3 years	20 years	Determinative. Guard of the process. Guardian of privacy guidelines.	Security & Privacy.
SI-1	University	Supplier	CTO	3,5 years	13 years	Supplier. We provide a platform (data gateway) for several Dutch hospitals.	Timeliness, validity, validity. Also: auditability, traceability, ownership of data. Stewardship and responsibility.
SI-2	University	Performation Consultancy	Senior Lead BI Consultant	12 years	20 years	creator and implementation, also partner of the BI platform. So design and implementation.	Security. In a hospital context. Certainly from the point of view of user acceptance. Hospitals do have some concerns about data in the cloud.

APPENDIX D2: OVERVIEW OF RESULTS

	DC			DS		SI		TOTAL				Aggregated	
Q. nr.	DC-1	DC-2	DC-3	DS-1	DS-2	SI-1	SI-2	Yes	Yes, but	Maybe	No	positive	negative
1	yes	yes	yes	yes	yes	yes	no	6	0	0	1	6	1
2	no	yes	yes	yes	yes	yes	yes	6	0	0	1	6	1
3	yes	yes	yes	yes	yes	yes, but	yes, but	5	2	0	0	7	0
4	yes	no	yes	yes	yes	yes	yes	6	0	0	1	6	1
5	yes	yes	yes	yes	yes	no	yes	6	0	0	1	6	1
6	yes	yes	yes	yes, but	yes	yes	yes	6	1	0	0	7	0
7a	yes	yes	yes	yes	yes	yes	yes	7	0	0	0	7	0
7b	maybe	no	yes	yes	yes	yes	yes	5	0	1	1	5	2
8	yes	yes, but	yes	no	yes, but	yes, but	yes, but	2	4	0	1	6	1
9	yes	yes	yes	yes	yes	yes	yes	7	0	0	0	7	0
10	yes	no	yes	yes	yes	yes	yes	6	0	0	1	6	1
11	yes	yes	maybe	yes	no	yes	yes	5	0	1	1	5	2
12	yes	yes	yes	yes	yes	yes	yes	7	0	0	0	7	0
13	no	yes	no	yes	yes	yes	yes	5	0	0	2	5	2
14	yes	yes	yes	yes	yes	yes	yes	7	0	0	0	7	0
15	yes	yes	yes	yes	yes	yes	yes	7	0	0	0	7	0
16	yes	yes	yes	yes	yes	yes, but	yes	6	1	0	0	7	0
17	yes	yes	yes	yes	yes	yes	yes	7	0	0	0	7	0
18	yes	yes	no	no	maybe	yes	yes, but	3	1	1	2	4	3
19	yes, but	yes, but	yes, but	yes, but	yes	yes, but	yes, but	1	6	0	0	7	0
20	yes	yes	yes	yes	yes	yes	maybe	6	0	1	0	6	1

APPENDIX D3: OVERVIEW OF RESULTS IN CLOSED CODING

Theme	dimension	item	Yes	Yes, but	Maybe	No
cloud governance	cloud general	business objectives	7	0	0	0
		cloud deployment model	7	0	0	0
		cloud specific roles	3	3	0	1
		financial objectives	5	0	1	1
		training	6	0	0	1
	Total cloud general		**28**	**3**	**1**	**3**
data governance	general	data governance decisions	5	0	1	1
		management support	5	0	0	2
		transparency and accountability	7	0	0	0
	Total general		**17**	**0**	**1**	**3**
	Process, Procedure & Policy	Process, Procedure & Policy	7	0	0	0
		standardization, documentation and repeatability	3	1	1	2
	Total Process, Procedure & Policy		**10**	**1**	**1**	**2**
	roles & responsibility	responsibility	7	0	0	0
		roles	7	0	0	0
		stakeholder collaboration	6	1	0	0
	Total roles & responsibility		**20**	**1**	**0**	**0**
	Tools & Measurement	API availability	6	0	1	0
		Tools & Measurement	1	5	0	1
	Total Tools & Measurement		**7**	**5**	**1**	**1**

ecosystem governance	decision making	authority	6	0	0	1
		pricing	6	0	0	1
	Total decision making		**12**	**0**	**0**	**2**
	trust and participation of stakeholders	active participation	6	0	0	1
		decision making method	6	0	0	1
		SLA	6	1	0	0
		transparency and openness	5	2	0	0
	Total trust and participation of stakeholders		**23**	**3**	**0**	**2**
Total			**117**	**13**	**4**	**13**
			79,6%	8,8%	2,7%	8,8%

APPENDIX D4: CODED QUESTION LIST

general
Starter questions
SQ1-What is your Educational level?
SQ2-Which department in your organization do you belong to?
SQ3-What is your Function (organizational position)?
SQ4-How many years of experience do you have in this position?
SQ5-How many years of work experience do you have in this industry?
SQ6-How would you describe the role of your organization in the platform ecosystem?
SQ7-In your opinion what are important elements of data governance in a cloud environment ecosystem? Why? Could you give an example?
Closing questions
FQ1-Do you think that we missed any governance mechanisms? If so, which?
FQ2-Do you think a framework is helpful in a cloud platform ecosystem? Why?
FQ3-Do you intend to use such a framework? Please explain.
FQ4-send a copy of the full report?
1. ecosystem governance
decision making
01-In a PaaS CPE environment, should the framework include an element regarding decision authority? What would happen if it didn't? Which party should be in the lead?
02-Do you think the pricing component of PaaS Environments should be a part of the CPE framework? Please elaborate
trust and participation of stakeholders
03-Are transparency and openness relevant for a CPE framework? What do you think?
04-From the ecosystem perspective; Do you think active participation of stakeholders should be part of a CPE framework? Is this based on your own experience?
05-Should the way in which governance related decisions are made within the ecosystem (such as architectural or more operational decisions), be a part of a CPE framework? Why?
06-Do you think setting up a SLA or CDGA should be part of a CPE Framework? Why?
2. cloud governance
cloud general
07-Regarding an organizations cloud business objectives and financial objectives; Do you think it should be part of a CPE framework? Why? Is this based on your own experience?
08-Do you think that having cloud specific roles in an organization should be part of a CPE framework?
09-Is it relevant to include the cloud deployment model in the framework (public, private, hybrid)? Why?

10-Do education and training of employees need to be included in a CPE framework? Why?
3. data governance
general
11-Data governance in a cloud platform ecosystem could be handled on the ecosystem level, or within the individual participating organizations. Do you think the decision should be part of a CPE framework? Do you have any experience on this matter?
12-Should the transparency and accountability of data governance be part of a CPE framework? How do you reason?
13-It is important that top-level management is providing support. Do you think that it should be included in this framework? Why? Can you provide examples?
Process, Procedure & Policy
17-Do you think that elements of Processes, Procedures & Policies should be part of a CPE framework? Which elements? And can you explain why?
18-Do you think that the standardization, documentation and repeatability of CPE processes and procedures should be part of the framework? Why?
roles & responsibility
14-Do you think that the roles within the CPE should be part of a CPE framework? Can you explain why?
15-Do you think that responsibility that go with these roles should be part of a CPE framework? Can you explain why?
16-Do you think that governance mechanisms for stakeholder collaboration should be a part of a CPE framework? Why?
Tools & Measurement
19-Do you think that tools & measurement should be part of an CPE framework? Can you explain why?
20-The availability of API's on a cloud platform are an important factor for developer interaction? Do you think it should be part of the CPE framework? Please explain.

APPENDIX D5: CASE DESCRIPTION

The ecosystem of our case consists of 3 autonomous organizations:

Organization	Type	Role in ecosystem
Spaarne Gasthuis	Hospital	Data Consumer
Epic Systems	EHR Supplier	Data Supplier
Performation	Consultancy	System Integrator

Spaarne Gasthuis is a middle sized hospital based in the Netherlands with locations in Haarlem and Hoofddorp. They have a capacity of 600 beds (by comparison: the largest hospital in the Netherlands has a capacity of 1100 beds), 4000 employees of which 3000 with healthcare related functions.

Epic Systems is a software company based in the USA, with offices in the Netherlands, Dubai, Singapore and Denmark. It serves 250 million patients and their doctors worldwide with software dedicated to different aspects of healthcare.

Performation is a Dutch system integrator with approximately 100 employees. It delivers software solutions to healthcare organizations for capacity management, finances, care registration and management information.

The main service that is provided by the platform is Business Intelligence. These organizations work together to make sure that the customers of the platform can access the data / information on the platform. Customers are the healthcare professionals, management and staff of the hospital. They rely on this platform to give them valid, reliable and timely information (financial, operational, etc.) within the scope of their activities.

The platform serves as a technological foundation upon which other firms develop complementary products and services. It is an innovative platform based on Microsoft technology (hybrid company).

Currently the platform is located on-premise. Meaning that it exists within the walls of the hospital. The services provided by the other two organizations needs to be delivered on site. The hospital as a driving force of the platform has expressed the wish to move to a cloud environment with 2-3 years, but because of the vulnerability of healthcare data, precautionary steps are needed to prevent loss of sensitive data.

APPENDIX D6: INTERVIEW SUMMARIES

INTERVIEW SI-1

This questionnaire is part of the thesis "Data governance in cloud platform ecosystems"

DEFINITION > CPE: Cloud Platform Ecosystem

INTRODUCTION

The interview will start with a general introduction to explain the goal of the interview and the research objective. After this both interviewer as interviewee will briefly introduce themselves.

STARTER QUESTIONS

Question	Answer
What is your Educational level?	University
Which department in your organization do you belong to?	Supplier
What is your Function (organizational position)?	CTO
How many years of experience do you have in this position?	3,5 years
How many years of work experience do you have in this industry?	13 years
How would you describe the role of your organization in the platform ecosystem?	Supplier / We provide a platform (data gateway) for several Dutch hospitals.
In your opinion what are important elements of data governance in a cloud environment ecosystem? Why? Could you give an example?	Timeliness and validity. But we are also seeing auditability and traceability. And also ownership of data. Stewardship and responsibility.

ECOSYSTEM ORGANISATION

DECISION MAKING

Platform governance can be defined as the partitioning of decision-making authority between platform owners and app developers and control mechanisms. In a PaaS (Platform as a Service) environment, the platform owner is not part of the ecosystem.

1. In a PaaS CPE environment, should the framework include an element regarding decision authority? What would happen if it didn't? Which party should be in the lead?

Answer	Rationale
Yes	In public cloud environments you have little influence on the platform, so it is good to think about this in advance. In a private cloud ,for example, you have more influence.

PaaS facilitates the development and deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers.

2. Do you think the pricing component of PaaS Environments should be a part of the CPE framework? Please elaborate.

Answer	Rationale
Yes	With most clouds you will get data in, but getting it out again suddenly becomes very expensive. In that sense, a good exit strategy is important to have. Furthermore, the scalability of the system is an important component in the costs.

TRUST AND PARTICIPATION OF STAKEHOLDERS

From an ecosystem perspective, participants should adopt transparency and openness to enhance trust so perceived risk can be reduced.

3. Are transparency and openness relevant for a CPE framework? What do you think?

Answer	Rationale
Yes, but	Necessary to have, just not that heavy. Also dependent on the context of the platform and its strategic importance to the organization.

4. From the ecosystem perspective; Do you think active participation of stakeholders should be part of a CPE framework? Is this based on your own experience?

Answer	Rationale
Yes	You want to know how active the ecosystem is. And something is happening there and further developments are being done.

5. Should the way in which governance related decisions are made within the ecosystem (such as architectural or more operational decisions), be a part of a CPE framework? Why?

Answer	Rationale
No	All successful platforms have governance with 1 party. If you open it up completely, you get a poldermodel. Then everything takes a long time to discuss.

Setting up a SLA between CPE organizations is a more formal way of governing the environment; regarding our research subject this could be called a Cloud Data Governance Agreement (CDGA).

6. Do you think setting up a SLA or CDGA should be part of a CPE Framework? Why?

Answer	Rationale
Yes	That data agreement is also important, sometimes you can get your data into the Cloud but not out again, so that is definitely something you want to know in advance.

CLOUD GOVERNANCE

Organizations should have governance structures in the form of cloud actors in place for managing cloud resources and participating in cloud processes. These structures should relate to the organisation's cloud business objectives and indirectly to their financial objectives.

7. Regarding an organizations cloud business objectives and financial objectives; Do you think it should be part of a CPE framework? Why? Is this based on your own experience?

Answer	Rationale
Yes	You move to the Cloud because you think you have certain benefits. Flexibility is one of them, but you do have to scale down and shut down your servers from time to time. That must be monitored.

8. Do you think that having cloud specific roles in an organization should be part of a CPE framework?

Answer	Rationale
Yes, but	These are new responsibilities and they must be handled, but a number of things can be secured in the existing IT team and with the Product Owners. So not necessarily in specific cloud roles.

9. Is it relevant to include the cloud deployment model in the framework (public, private, hybrid)? Why?

Answer	Rationale
Yes	It is not a yes or no cloud, but which parts do we solve in the cloud and which parts do we still actually do in-house. What part is private cloud and what is public cloud.

10. Do education and training of employees need to be included in a CPE framework? Why?

Answer	Rationale
Yes	On the technological side alone, there will be a whole range of ways to manage, scale up, scale down and monitor the cloud environment. But also the legal side of things require extra knowledge.

DATA GOVERNANCE

The data governance function can be considered as a collection of master activities for implementation of data governance. It introduces controls for monitoring compliance and reduces risks by creating risk-mitigating policies. Before launching the formal programme it is important for the organization to define the DG requirements and be transparent and accountable about it.

11. Data governance in a cloud platform ecosystem could be handled on the ecosystem level, or within the individual participating organizations. Do you think the decision should be part of a CPE framework? Do you have any experience on this matter?

Answer	Rationale
Yes	If you are going to rely on sources in an ecosystem that you do not control yourself, then you want to know how they are managed and what the definitions are. The platform does have 1 party as a driving force, but several parties have to deal with the data on the platform.

12. Should the transparency and accountability of data governance be part of a CPE framework? How do you reason?

Answer	Rationale
Yes	It may well be that the platform belongs to 1 party, but you want to know how it works for everything that is offered on that platform.

13. It is important that top-level management is providing support. Do you think that it should be included in this framework? Why? Can you provide examples?

Answer	Rationale
Yes	If you go all-in on such an ecosystem, then that is such a great risk for most organizations that the Supervisory Board, Management Board must be aware of it. You want your Board to be informed and aware of the risks.

ROLES & RESPONSIBILITY

Clearly specified roles and responsibilities of that roles will help actors within organizations to understand what is required from them.

14. Do you think that the roles within the CPE should be part of a CPE framework? Can you explain why?

Answer	Rationale
Yes	If you do it yourself, you often have the people internally in your organization and if there is a hierarchical line, you can enforce things. When you move to the cloud in an ecosystem, you have to make agreements about this. Because you can no longer enforce it hierarchically.

15. Do you think that responsibility that go with these roles should be part of a CPE framework? Can you explain why?

Answer	Rationale
Yes	Now you have to rely on people in other organizations and it is good to define roles and responsibilities.

To enable the collaboration between stakeholders, organizations can implement relational governance mechanisms to facilitate them. These mechanisms encompass communication, training and the coordination of decision making.

16. Do you think that governance mechanisms for stakeholder collaboration should be a part of a CPE framework? Why?

Answer	Rationale
Yes, but	You have certain types of platforms and ecosystems. This part of the framework is not necessary if it is a simple cloud service, but it does when the platform requires intensive collaboration.

PROCESS, PROCEDURE & POLICY

Processes, procedures and policies aim to ensure that data is recorded accurately, held securely, used effectively, and shared appropriately.

17. Do you think that elements of Processes, Procedures & Policies should be part of a CPE framework? Which elements? And can you explain why?

Answer	Rationale
Yes	Now you do it yourself and you yourself are responsible for it. In a cloud environment you place the responsibility with a supplier. And you also want to know how it is arranged in terms of security and quality.

18. Do you think that the standardization, documentation and repeatability of CPE processes and procedures should be part of the framework? Why?

Answer	Rationale
Yes, but	You place part of the responsibility with other partners on the platform. As a result, you have less to do with it yourself, but if you still try to document everything, you also lose the benefits of such a platform. To a certain extent, you will have to rely on the other partners.

TOOLS & MEASUREMENT

To increase the reliability of the data governance process in a cloud environment, measurement is needed. It can be used for overall progress and detected issues, if incoming and existing data meets business rules and if SLA conditions are followed.

19. Do you think that tools & measurement should be part of an CPE framework? Can you explain why?

Answer	Rationale
Yes, but	That is specific to each ecosystem. Some applications do not, but on a platform you need tooling to validate loads, see differences from loads, view turnaround times, versions, statuses, etc. This allows you to gain insight into the system.

20. The availability of API's on a cloud platform are an important factor for developer interaction? Do you think it should be part of the CPE framework? Please explain.

Answer	Rationale
Yes	You just want to know how to interact with something that is much more of a black box than before and you really want to have control over that.

CLOSING

Question	Answer
Do you think that we missed any governance mechanisms? If so, which?	Yes, the physical location of such an ecosystem. If it is in Dutch hands, is it European, international, also really an essential to record.
Do you think a framework is helpful in a cloud platform ecosystem? Why?	Yes, if only to ask yourself all the questions on all axes. I do see such a control framework working in a number of levels. If it's mission critical, then you want all those controls to be fully utilized, but maybe not for smaller environments.
Do you intend to use such a framework? Please explain.	No, but that also has to do with the scale. As a supplier we belong to SMEs and do not personally use it, but perhaps some elements.
Do you find the interview useful for your cloud platform ecosystem? Why?	Yes

Thank the respondent for the time and confirm that any audio recording will be deleted after processing. An interview report will be sent so that the respondent can verify that everything has been correctly interpreted.

INTERVIEW SI-2

This questionnaire is part of the thesis "Data governance in cloud platform ecosystems"

DEFINITION > CPE: Cloud Platform Ecosystem

INTRODUCTION

The interview will start with a general introduction to explain the goal of the interview and the research objective. After this both interviewer as interviewee will briefly introduce themselves.

STARTER QUESTIONS

Question	Answer
What is your Educational level?	University – Sociology and economy
Which department in your organization do you belong to?	Performation Consultancy
What is your Function (organizational position)?	Senior Lead BI Consultant
How many years of experience do you have in this position?	12 years
How many years of work experience do you have in this industry?	20 years
How would you describe the role of your organization in the platform ecosystem?	creator and implementation, partner of the BI platform. So design and implementation.
In your opinion what are important elements of data governance in a cloud environment ecosystem? Why? Could you give an example?	Security. In a hospital context. Certainly from the point of view of user acceptance. Hospitals do have some concerns about data in the cloud.

ECOSYSTEM ORGANISATION

DECISION MAKING

Platform governance can be defined as the partitioning of decision-making authority between platform owners and app developers and control mechanisms. In a PaaS (Platform as a Service) environment, the platform owner is not part of the ecosystem.

1. In a PaaS CPE environment, should the framework include an element regarding decision authority? What would happen if it didn't? Which party should be in the lead?

Answer	Rationale
No	Ownership of the platform lies with the hospital. Change process must be in place. Everyone is responsible for their own piece.

PaaS facilitates the development and deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers.

2. Do you think the pricing component of PaaS Environments should be a part of the CPE framework? Please elaborate.

Answer	Rationale
Yes	Within the platform there are always alternatives that you could choose, for different prices. For example for data storage. Otherwise you'd only have a choice on functionality. If costs become an operational expense, then they normally also need to be controlled.

TRUST AND PARTICIPATION OF STAKEHOLDERS

From an ecosystem perspective, participants should adopt transparency and openness to enhance trust so perceived risk can be reduced.

3. Are transparency and openness relevant for a CPE framework? What do you think?

Answer	Rationale
Yes, but	Important, but difficult to measure.

4. From the ecosystem perspective; Do you think active participation of stakeholders should be part of a CPE framework? Is this based on your own experience?

Answer	Rationale
Yes	If you are not involved as a stakeholder, other parties in the ecosystem cannot proactively make changes and damage may occur. And if a party is not involved, then you will have to come up with something to keep the damage as minimal as possible.

5. Should the way in which governance related decisions are made within the ecosystem (such as architectural or more operational decisions), be a part of a CPE framework? Why?

Answer	Rationale
Yes	It will have to be described in some way. Decisions in a certain area are taken a certain party. Ultimately, however, it must be clear where the decisions are made and it must be clear where the consultative bodies and the consultation situations are in order to arrive at a good decision.

Setting up a SLA between CPE organizations is a more formal way of governing the environment; regarding our research subject this could be called a Cloud Data Governance Agreement (CDGA).

6. Do you think setting up a SLA or CDGA should be part of a CPE Framework? Why?

Answer	Rationale
Yes	You want to formalize your cooperation to a certain extent and you want to be clear about who is responsible for what. And possibly what the time periods within those responsibilities are within which action must be taken.

CLOUD GOVERNANCE

Organizations should have governance structures in the form of cloud actors in place for managing cloud resources and participating in cloud processes. These structures should relate to the organisation's cloud business objectives and indirectly to their financial objectives.

7. Regarding an organizations cloud business objectives and financial objectives; Do you think it should be part of a CPE framework? Why? Is this based on your own experience?

Answer	Rationale
Yes	If saving costs is a goal, then you also have to measure that, so you can make your own IT team leaner and meaner. So the moment you go to the cloud and you see the number of administrators growing in your organization, something went wrong.

8. Do you think that having cloud specific roles in an organization should be part of a CPE framework?

Answer	Rationale
Yes, but	The administrator role does not really change. There will be new functionalities that you want to mention that someone picks them up, but in principle that is not specifically a cloud role.

9. Is it relevant to include the cloud deployment model in the framework (public, private, hybrid)? Why?

Answer	Rationale
Yes	That is an essential part of your architecture. If you make the choice between private or hybrid, there is a fairly substantial investment component to be taken into account.

10. Do education and training of employees need to be included in a CPE framework? Why?

Answer	Rationale
Yes	That is obvious, but that is one that you can only name later in the process. First you need to know how you are going to organize things before you can start thinking about training

DATA GOVERNANCE

The data governance function can be considered as a collection of master activities for implementation of data governance. It introduces controls for monitoring compliance and reduces risks by creating risk-mitigating policies. Before launching the formal programme it is important for the organization to define the DG requirements and be transparent and accountable about it.

11. Data governance in a cloud platform ecosystem could be handled on the ecosystem level, or within the individual participating organizations. Do you think the decision should be part of a CPE framework? Do you have any experience on this matter?

Answer	Rationale
Yes	If one party thinks we are doing it at the ecosystem level and the other thinks we are doing it at the organizational level, you will get some difference in expectations

12. Should the transparency and accountability of data governance be part of a CPE framework? How do you reason?

Answer	Rationale
Yes	I have encountered a customer who necessarily did not want to share the definitions and thus explicitly chose not to be transparent or accountable. You want to be sure of that in advance.

13. It is important that top-level management is providing support. Do you think that it should be included in this framework? Why? Can you provide examples?

Answer	Rationale
Yes	You can assume that especially with migrations to the cloud that resistance will arise in the organization, you need the organizational power to push it through.

ROLES & RESPONSIBILITY

Clearly specified roles and responsibilities of that roles will help actors within organizations to understand what is required from them.

14. Do you think that the roles within the CPE should be part of a CPE framework? Can you explain why?

Answer	Rationale
Yes	What can we expect from each other. Where can we hold each other accountable. Where can which decisions be taken. Where should which decisions not be taken.

15. Do you think that responsibility that go with these roles should be part of a CPE framework? Can you explain why?

Answer	Rationale
Yes	See question 14. Wherein Performation will have to obtain approval from the hospital in basically every situation.

To enable the collaboration between stakeholders, organizations can implement relational governance mechanisms to facilitate them. These mechanisms encompass communication, training and the coordination of decision making.

16. Do you think that governance mechanisms for stakeholder collaboration should be a part of a CPE framework? Why?

Answer	Rationale
Yes	At some point when we enter this process, we will have to say something about training. About which subjects and to whom. It must be clear what the subjects of communication will be and the way in which they are communicated, for example by means of daily standups.

Process, Procedure & Policy

Processes, procedures and policies aim to ensure that data is recorded accurately, held securely, used effectively, and shared appropriately.

17. Do you think that elements of Processes, Procedures & Policies should be part of a CPE framework? Which elements? And can you explain why?

Answer	Rationale
Yes	Those are your functional requirements. They must be clear, how safe, but also about archive obligations, such matters. That is important for hospitals. They adhere to fairly long filing deadlines.

18. Do you think that the standardization, documentation and repeatability of CPE processes and procedures should be part of the framework? Why?

Answer	Rationale
Yes, but	In any case, standardization and documentation should be, but repeatability is not certain. You only go to the cloud once so that just needs to be repeated. And when it comes to the processes, it follows from standardization.

Tools & Measurement

To increase the reliability of the data governance process in a cloud environment, measurement is needed. It can be used for overall progress and detected issues, if incoming and existing data meets business rules and if SLA conditions are followed.

19. Do you think that tools & measurement should be part of an CPE framework? Can you explain why?

Answer	Rationale
Yes, but	The technical choices to be made on the platform should not be part of the framework (e.g. the choice of the type of databases). Perhaps when it comes to tools that will run on the platform because that affects the daily operation. The

moment you formulate those objectives, you must have measurements that measure whether objectives are being achieved or not.

20. The availability of API's on a cloud platform are an important factor for developer interaction? Do you think it should be part of the CPE framework? Please explain.

Answer	Rationale
Maybe	They are important to have, but a cloud platform cannot function without APIs, so there are.

CLOSING

Question	Answer
Do you think that we missed any governance mechanisms? If so, which?	No. I am not working on this subject on a daily basis, I cannot judge whether I have missed something.
Do you think a framework is helpful in a cloud platform ecosystem? Why?	Yes. Checklists are useful.
Do you intend to use such a framework? Please explain.	Yes. Or let someone else do that.
Do you find the interview useful for your cloud platform ecosystem? Why?	Yes.

Thank the respondent for the time and confirm that any audio recording will be deleted after processing. An interview report will be sent so that the respondent can verify that everything has been correctly interpreted.

INTERVIEW DS-1

This questionnaire is part of the thesis "Data governance in cloud platform ecosystems"

DEFINITION > CPE: Cloud Platform Ecosystem

INTRODUCTION

The interview will start with a general introduction to explain the goal of the interview and the research objective. After this both interviewer as interviewee will briefly introduce themselves.

STARTER QUESTIONS

Question	Answer
What is your Educational level?	Bachelors degree
Which department in your organization do you belong to?	Analytics Implementation / data driven.
What is your Function (organizational position)?	We ensure as we digitize hospitals that we can get the most from the information that is stored digitally. So ensuring that there the right business intelligence products are developed alongside a digitization of a hospital. My function could be described as "Research Strategist".
How many years of experience do you have in this position?	10 years
How many years of work experience do you have in this industry?	14 years
How would you describe the role of your organization in the platform ecosystem?	To help with the modeling of data. The understanding of the meaning of the data and making sure that it can be represented by an ontological standard. So you could say the semantic meaning of the data.
In your opinion what are important elements of data governance in a cloud environment ecosystem? Why? Could you give an example?	If the service provided by the cloud platform comes with a preferred information standard. And a key part of the data governance process would be mapping to that standard.

ECOSYSTEM ORGANISATION

DECISION MAKING

Platform governance can be defined as the partitioning of decision-making authority between platform owners and app developers and control mechanisms. In a PaaS (Platform as a Service) environment, the platform owner is not part of the ecosystem.

1. In a PaaS CPE environment, should the framework include an element regarding decision authority? What would happen if it didn't? Which party should be in the lead?

Answer	Rationale

Yes	Those are the types of discussions that we would have before we would begin a data transfer for them. It would be a partnership to help them move to the cloud and it would have to be clear who is responsible for which aspects of that and who maintains the governance of the data flows. We would want to be absolutely sure there's no possibility of a breach or of personal health information escaping. For example, yeah want to ensure that that transfer of information is being done safely and securely.

PaaS facilitates the development and deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers.

2. Do you think the pricing component of PaaS Environments should be a part of the CPE framework? Please elaborate.

Answer	Rationale
Yes	The pricing be part of that, of course it has to be right there and potentially hidden costs in future costs of expansion of use. They would need to be able to project the costs no how it might expand based on getting socialized within the organization. So in a basic sense, if you have a successful proof of concept, what is your plan for expanding that proof of concept and how does how would your usage go up as if it evolves as planned and then if your usage goes up, what is the incurred cost?

TRUST AND PARTICIPATION OF STAKEHOLDERS

From an ecosystem perspective, participants should adopt transparency and openness to enhance trust so perceived risk can be reduced.

3. Are transparency and openness relevant for a CPE framework? What do you think?

Answer	Rationale
Yes	To assess mutual risk, especially under with sensitive information. I think certainly from a technical perspective, people are interacting with the platform. Security risks that may incur. if you are harmonizing data, it's essential that applications that are interacting with that data know how the meaning was derived, because it could change the actual output of their use case.

4. From the ecosystem perspective; Do you think active participation of stakeholders should be part of a CPE framework? Is this based on your own experience?

Answer	Rationale
Yes	If we were to engage in a project to harmonize data, we would want to ensure that the participants are actively involved, otherwise we would not want to invest our own resource knowing that it's not going to be successful without active participation

5. Should the way in which governance related decisions are made within the ecosystem (such as architectural or more operational decisions), be a part of a CPE framework? Why?

Answer	Rationale
Yes	It might depend on the granularity of the decision, but you would want at least some level of rules of the road. At least with certain basic principles.

Setting up a SLA between CPE organizations is a more formal way of governing the environment; regarding our research subject this could be called a Cloud Data Governance Agreement (CDGA).

6. Do you think setting up a SLA or CDGA should be part of a CPE Framework? Why?

Answer	Rationale
Yes, but	It pertains to data security standards and safety, although you should have your freedom to have your own service level agreement with your customers so that would be at a local level.

Cloud Governance

Organizations should have governance structures in the form of cloud actors in place for managing cloud resources and participating in cloud processes. These structures should relate to the organisation's cloud business objectives and indirectly to their financial objectives.

7. Regarding an organizations cloud business objectives and financial objectives; Do you think it should be part of a CPE framework? Why? Is this based on your own experience?

Answer	Rationale
Yes	Before moving to the cloud, you would need to have an understanding of how you are going to scale resources to meet your objectives. If you discover that you're about to have 10,000 more users, you would want to know that the platform can handle that or it is scalable

8. Do you think that having cloud specific roles in an organization should be part of a CPE framework?

Answer	Rationale
No	That feels like it would be inevitable and doesn't need to be part of the framework, seems like a core definition of it.

9. Is it relevant to include the cloud deployment model in the framework (public, private, hybrid)? Why?

Answer	Rationale
Yes	I would want that to be part of the framework an because you're probably have local resourcing involved if you chose private.

10. Do education and training of employees need to be included in a CPE framework? Why?

Answer	Rationale
Yes	You would want people to be able to maintain data flow to the cloud. I would want to ensure that my staff could ensure uninterrupted delivery to that cloud solution. As a prerequisite for moving.

DATA GOVERNANCE

The data governance function can be considered as a collection of master activities for implementation of data governance. It introduces controls for monitoring compliance and reduces risks by creating risk-mitigating policies. Before launching the formal programme it is important for the organization to define the DG requirements and be transparent and accountable about it.

11. Data governance in a cloud platform ecosystem could be handled on the ecosystem level, or within the individual participating organizations. Do you think the decision should be part of a CPE framework? Do you have any experience on this matter?

Answer	Rationale
Yes	I think you would have a baseline set of principles at the ecosystem level and then at a local level you would require the principles to match the ecosystem principles. You would always have security principles designed defined at the ecosystem level.

12. Should the transparency and accountability of data governance be part of a CPE framework? How do you reason?

Answer	Rationale
Yes	Being able to demonstrate certain security practices, is often part of certification. That would be particularly important where more of the functions are handled by a party that doesn't have a public profile like Microsoft for example.

13. It is important that top-level management is providing support. Do you think that it should be included in this framework? Why? Can you provide examples?

Answer	Rationale
Yes	Having support at a top level management active for data infrastructure is always a challenge. Thinking about Spaarne, mandating that level of accountability at an organizational level would be helpful. Is it in theory essential to the technology? No. Is it good from a process standpoint and to make sure that there is executive buy-in for the architecture strategy? Yes

ROLES & RESPONSIBILITY

Clearly specified roles and responsibilities of that roles will help actors within organizations to understand what is required from them.

14. Do you think that the roles within the CPE should be part of a CPE framework? Can you explain why?

Answer	Rationale
Yes	It needs to be clear who is, for example, going to write ETL's to deliver data to the cloud. For example, it needs to be clear who's going to deal with errors or issues that arise in those sorts of things are pretty fundamental

15. Do you think that responsibility that go with these roles should be part of a CPE framework? Can you explain why?

Answer	Rationale
Yes	You have someone who's responsible for extract, transform and load and you could say ETL administrator and most people would have a standard conception of what that is, but it's still useful to itemize that just in case

To enable the collaboration between stakeholders, organizations can implement relational governance mechanisms to facilitate them. These mechanisms encompass communication, training and the coordination of decision making.

16. Do you think that governance mechanisms for stakeholder collaboration should be a part of a CPE framework? Why?

Answer	Rationale
Yes, depends	It depends on the use case. If you are contributing data to a shared resource that is harmonized, then you absolutely need to have a discussion about, or have some structure set up for decision making.

Process, Procedure & Policy

Processes, procedures and policies aim to ensure that data is recorded accurately, held securely, used effectively, and shared appropriately.

17. Do you think that elements of Processes, Procedures & Policies should be part of a CPE framework? Which elements? And can you explain why?

Answer	Rationale
Yes	Data sharing, should, as in how is the data safely and securely getting to the cloud? That should be part of the framework, so anything that's security related should be. An organizational principle could be that you need to delete healthcare data after X period of time. Even in the cloud you would need to comply with that principle, perhaps even more so in the cloud

18. Do you think that the standardization, documentation and repeatability of CPE processes and procedures should be part of the framework? Why?

Answer	Rationale
No	I would expect that the documentation on the on policies and procedures at the ecosystem would need to be part of the framework at a local level. That's less important in the ecosystem, it's more implicit.

TOOLS & MEASUREMENT

To increase the reliability of the data governance process in a cloud environment, measurement is needed. It can be used for overall progress and detected issues, if incoming and existing data meets business rules and if SLA conditions are followed.

19. Do you think that tools & measurement should be part of an CPE framework? Can you explain why?

Answer	Rationale
No	Certainly you need them, for things like upholding the SLA metrics. Tools should be responsive, but whether that that is outside of the SLA doesn't matter that much, it's kind of implied by the SLA.

20. The availability of API's on a cloud platform are an important factor for developer interaction? Do you think it should be part of the CPE framework? Please explain.

Answer	Rationale
Yes	It's probably the whole point you're using the cloud. Is to have A to have an understanding of what APIs can be used to access cloud. You would need to make sure that it's a tenable solution. You can physically get the data there, or an access the data in ways that meet your use cases, and that usually involves an API discussion. So I do think checking it beforehand makes sense

CLOSING

Question	Answer
Do you think that we missed any governance mechanisms? If so, which?	Case related governance. So if you're agreeing to harmonize data for example for research purposes, you might have a counsel that helps you govern what the priorities are.
Do you think a framework is helpful in a cloud platform ecosystem? Why?	Yes, it sounds like you have put a solid checklist together of base level understanding
Do you intend to use such a framework? Please explain.	I think we kind of already do, in some cases we have similar projects like this that have many of these elements.
Do you find the interview useful for your cloud platform ecosystem? Why?	I think the one thing that's challenging is a lot of the terms are jargony. And it's quite abstract to use the terms without examples. If there's a way of doing that without leading the witness and biasing your results, I would recommend doing that.

Thank the respondent for the time and confirm that any audio recording will be deleted after processing. An interview report will be sent so that the respondent can verify that everything has been correctly interpreted.

INTERVIEW DS-2

This questionnaire is part of the thesis "Data governance in cloud platform ecosystems"

DEFINITION > CPE: Cloud Platform Ecosystem

INTRODUCTION

The interview will start with a general introduction to explain the goal of the interview and the research objective. After this both interviewer as interviewee will briefly introduce themselves.

STARTER QUESTIONS

Question	Answer
What is your Educational level?	Bachelor - Astronomy
Which department in your organization do you belong to?	Epic - Technical support
What is your Function (organizational position)?	Technical analyst – strategic
How many years of experience do you have in this position?	6 years
How many years of work experience do you have in this industry?	9 years
How would you describe the role of your organization in the platform ecosystem?	Depends on customer, it differs from hosting and providing technical support to providing pieces of the platform.
In your opinion what are important elements of data governance in a cloud environment ecosystem? Why? Could you give an example?	Mostly similar to non-cloud environments. Consistent documentation and communication. Enforcing them in an environment with a different type of control will change, but elements will remain the same.

ECOSYSTEM ORGANISATION

DECISION MAKING

Platform governance can be defined as the partitioning of decision-making authority between platform owners and app developers and control mechanisms. In a PaaS (Platform as a Service) environment, the platform owner is not part of the ecosystem.

1. In a PaaS CPE environment, should the framework include an element regarding decision authority? What would happen if it didn't? Which party should be in the lead?

Answer	Rationale
Yes	The people that actually set up the platform are not the owners of the ecosystem and outside of the decision making process. The people who create contents for the consumers should be in the lead. The lines become blurred when changes are made within a lower scope of decision making. Especially when data suppliers deliver the same software to multiple companies.

PaaS facilitates the development and deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers.

2. Do you think the pricing component of PaaS Environments should be a part of the CPE framework? Please elaborate.

Answer	Rationale
Yes	Different vendors are going to have different prices and whether that ecosystem is going to be beneficial, the costs have to be evaluated. A cloud environment differs from on premise, in a way that you can make different kind of decision on processing power for certain processes.

TRUST AND PARTICIPATION OF STAKEHOLDERS

From an ecosystem perspective, participants should adopt transparency and openness to enhance trust so perceived risk can be reduced.

3. Are transparency and openness relevant for a CPE framework? What do you think?

Answer	Rationale
Yes	You have to make sure that everybody is on the same page or else you might have an undesired outcome because something was done or processed in a way that you didn't expect due to not having the layer of transparency you need.

4. From the ecosystem perspective; Do you think active participation of stakeholders should be part of a CPE framework? Is this based on your own experience?

Answer	Rationale
Yes	The governance team needs to be made of the stakeholders across the different participating groups and that group needs to come together at a regular frequency and that is dependent on how many changes in and how active the ecosystem is and on how quickly things change within the ecosystem. There needs to be participation for both technical stakeholders as well as operational stakeholders on all types of decisions, because you almost always can't make a decision on one without affecting the other.

5. Should the way in which governance related decisions are made within the ecosystem (such as architectural or more operational decisions), be a part of a CPE framework? Why?

Answer	Rationale
Yes	You need a governance group that's coming together. These stakeholders need to come together and make decisions. Those decisions if possible should be tracked within the ecosystem and enforced within the ecosystem to some extent. The general framework should support governance decisions. Between the architectural decisions or operational decisions there's a difference in who ultimately gets the final say.

Setting up a SLA between CPE organizations is a more formal way of governing the environment; regarding our research subject this could be called a Cloud Data Governance Agreement (CDGA).

6. Do you think setting up a SLA or CDGA should be part of a CPE Framework? Why?

Answer	Rationale
Yes	You always have to have a baseline from which you derive your principles and those need to be documented, agreed upon and put into legal writing. Although, looking from a "providing a good service" perspective, if you ever actually have to pull A SLA up and look at it, you failed.

CLOUD GOVERNANCE

Organizations should have governance structures in the form of cloud actors in place for managing cloud resources and participating in cloud processes. These structures should relate to the organisation's cloud business objectives and indirectly to their financial objectives.

7. Regarding an organizations cloud business objectives and financial objectives; Do you think it should be part of a CPE framework? Why? Is this based on your own experience?

Answer	Rationale
Yes	How you manifested this versus, for instance, the more structural governance that we're talking about. Previously, I think they are all they can be part of the same body.

8. Do you think that having cloud specific roles in an organization should be part of a CPE framework?

Answer	Rationale
Yes, but	If a larger percentage of your technical infrastructure is moving into the cloud, you need specialists that are going to work with it, whether it's managing the contracts, or thinking about data transition portions. There needs to be some level of cloud specific knowledge and ownership there. But this applies only when you get to a critical mass.

9. Is it relevant to include the cloud deployment model in the framework (public, private, hybrid)? Why?

Answer	Rationale
Yes	It's a consideration in the process. You are the shepherds of the data that you collect. And the security measures you put, the processes you put to protect that data will change and depends on what kind of cloud deployment model you're using, and so you need to have that as a consideration, because that will impact the security measures you put on for accessing the data

10. Do education and training of employees need to be included in a CPE framework? Why?

Answer	Rationale
Yes	Absolutely employees need to understand how the platform works and how data is moving. That education is important. People need to understand what they're dealing with and how they're interacting with it. You can do push or pull education to either force people or offer resources. If you're doing just a very small ecosystem, a pull system seem more appropriate. But if all of the patient data is making its way into the cloud, you should make sure all relevant employees will have had proper training.

DATA GOVERNANCE

The data governance function can be considered as a collection of master activities for implementation of data governance. It introduces controls for monitoring compliance and reduces risks by creating risk-mitigating policies. Before launching the formal programme it is important for the organization to define the DG requirements and be transparent and accountable about it.

11. Data governance in a cloud platform ecosystem could be handled on the ecosystem level, or within the individual participating organizations. Do you think the decision should be part of a CPE framework? Do you have any experience on this matter?

Answer	Rationale
No	There are layers, there are ecosystems on top of ecosystems. We would set up a technical box around the hospital and within that box it should be an individual decision maker. But on the underlying level, the data supplier is the primary decision maker, and it's their responsibility to inform those organizations of the decisions made. The Data supplier should have limited to no input in that data governance strategy. They should only advise based on experience with the software and how it can be used in effective ways.

12. Should the transparency and accountability of data governance be part of a CPE framework? How do you reason?

Answer	Rationale
Yes	You need transparency and accountability to track how decisions are made and enforced and in case of violations, you need a tracking system and a root cause analysis (RCA) process, to understand why it was violated and then how to remediate. How do we make sure it doesn't happen again in that situation.

13. It is important that top-level management is providing support. Do you think that it should be included in this framework? Why? Can you provide examples?

Answer	Rationale
Yes	That goes regardless of whatever we're talking about. Everybody should be involved in these. I don't believe in a situation anyone says “hands off”. That's

	not how I like to work. You don't want micromanagement. You want the level of awareness and support that's necessary based on how the situation

Roles & Responsibility

Clearly specified roles and responsibilities of that roles will help actors within organizations to understand what is required from them.

14. Do you think that the roles within the CPE should be part of a CPE framework? Can you explain why?

Answer	Rationale
Yes	I think that you should always come to a situation in which a set of defined roles that are necessary for supporting. So if you're the provider of the framework you should come out and say when you're using this framework, we'd expect you to have these types of roles and responsibilities to which each organization consuming the framework would apply their own set of filters in their own set of definitions to that, and expand upon that.

15. Do you think that responsibility that go with these roles should be part of a CPE framework? Can you explain why?

Answer	Rationale
Yes	Each organisation should be able to determine the responsibilities as part of using the framework. If you're providing a framework and part of the service you're providing is to create a place where people can go and operate fairly independently, then these people need to be enabled to understand how to interact properly with the platform. They would need to know what they need to do in interacting with that platform to execute on that vision effectively.

To enable the collaboration between stakeholders, organizations can implement relational governance mechanisms to facilitate them. These mechanisms encompass communication, training and the coordination of decision making.

16. Do you think that governance mechanisms for stakeholder collaboration should be a part of a CPE framework? Why?

Answer	Rationale
Yes	The framework should have an outline of how collaboration should be done. When you're providing that platform to a new person, you want to give them a starting place that they will be effective from. But you also don't want to be so strong armed and so rigid that they can't adjust to their own personal needs of working with it, and so giving him a starting place, yes, controlling them and forcing them into a certain way of working, no.

Process, Procedure & Policy

Processes, procedures and policies aim to ensure that data is recorded accurately, held securely, used effectively, and shared appropriately.

17. Do you think that elements of Processes, Procedures & Policies should be part of a CPE framework? Which elements? And can you explain why?

Answer	Rationale
Yes	You need to provide a mechanism through which these things can be done. Both process as well as the actual technical. How do you apply that process part.

18. Do you think that the standardization, documentation and repeatability of CPE processes and procedures should be part of the framework? Why?

Answer	Rationale
Less so	There should be a template for these processes for repeatability and documentation reasons. But if there are going to be a lot of custom workflows, a lot of custom processes, a lot of individual variations, it doesn't make sense to put it on the provider to come up and provide those for them.

TOOLS & MEASUREMENT

To increase the reliability of the data governance process in a cloud environment, measurement is needed. It can be used for overall progress and detected issues, if incoming and existing data meets business rules and if SLA conditions are followed.

19. Do you think that tools & measurement should be part of an CPE framework? Can you explain why?

Answer	Rationale
Yes	Performance like you should be able to provide the metrics and the real time data to be able to understand how your platform is operating at a basic level. Primarily the technical performance of the platform itself.

20. The availability of API's on a cloud platform are an important factor for developer interaction? Do you think it should be part of the CPE framework? Please explain.

Answer	Rationale
Yes, mandatory	Mandatory. A modern system needs to be extensible. Data transport and portability is really important, often you need to plug into niche vendors that can meet a specific business need, and data interoperability is required. You need to make sure that you put processes in place for when you're extending these APIs to other organizations that you're going to do it in a safe and effective way.

CLOSING

Question	Answer

Do you think that we missed any governance mechanisms? If so, which?	I think the one thing that needs to be represented maybe that we didn't call out is the patients perspective. If we're talking specifically about healthcare and healthcare governance, I think you have to have one arm. That is understand at minimum understanding the patients perspective.
Do you think a framework is helpful in a cloud platform ecosystem? Why?	I do think having a framework would be helpful in a cloud platform ecosystem. This is a new concept to a lot of people. A lot of decision makers don't understand what it means to work in the cloud ecosystem. Providing a framework is going to help navigate from the people that have spent time in there thinking about it and translating that information to a someone that's more concerned.
Do you intend to use such a framework? Please explain.	I think we at Epic, we've probably created our own one. It is not as formal as the way you're thinking about it now, and I think formalizing it more so would be beneficial for us as a company.
Do you find the interview useful for your cloud platform ecosystem? Why?	I think it it it definitely got myself thinking about some of the different aspects of how the real world consumers, the folks on the side of the hospital and actually less so for Spaarne. But more so for the UK organization I work with who uses essentially a cloud platform they have Epic hosted so from their perspective it's a cloud platform. Uh, for their solution and how they interact and view the platform. I think it's it's definitely. Making me try to sit at a position that I've never purposely tried to put my mind into to look back at Epic rather than looking at epic towards them. And I think from that perspective it's going to. It's going to help create some good ideas for me to think about, because these are people that I have to interact with every day.

Thank the respondent for the time and confirm that any audio recording will be deleted after processing. An interview report will be sent so that the respondent can verify that everything has been correctly interpreted.

INTERVIEW DC-1

This questionnaire is part of the thesis "Data governance in cloud platform ecosystems"

DEFINITION > CPE: Cloud Platform Ecosystem

INTRODUCTION

The interview will start with a general introduction to explain the goal of the interview and the research objective. After this both interviewer as interviewee will briefly introduce themselves.

STARTER QUESTIONS

Question	Answer
What is your Educational level?	University
Which department in your organization do you belong to?	ICT
What is your Function (organizational position)?	Head of BI
How many years of experience do you have in this position?	3 years
How many years of work experience do you have in this industry?	15 years
How would you describe the role of your organization in the platform ecosystem?	Customer. In a customer-supplier relationship
In your opinion what are important elements of data governance in a cloud environment ecosystem? Why? Could you give an example?	Very clear agreements. Insight into data flows. Ownership. Responsibility. Such as, for example, with a data breach. Guaranteeing security and privacy Security / authorization

ECOSYSTEM ORGANISATION

DECISION MAKING

Platform governance can be defined as the partitioning of decision-making authority between platform owners and app developers and control mechanisms. In a PaaS (Platform as a Service) environment, the platform owner is not part of the ecosystem.

1. In a PaaS CPE environment, should the framework include an element regarding decision authority? What would happen if it didn't? Which party should be in the lead?

Answer	Rationale
Yes	Otherwise everyone will have a free hand. I think you should record somewhere how you come to such a decision or who is allowed to do this or under what conditions.

PaaS facilitates the development and deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers.

2. Do you think the pricing component of PaaS Environments should be a part of the CPE framework? Please elaborate.

Answer	Rationale
No	And the price is more of a financial element, which is assigned to 1 party in the ecosystem and is therefore not relevant for the ecosystem as a whole. Then you should broaden the scope by also adding other hospitals or care parties to the ecosystem.

TRUST AND PARTICIPATION OF STAKEHOLDERS

From an ecosystem perspective, participants should adopt transparency and openness to enhance trust so perceived risk can be reduced.

3. Are transparency and openness relevant for a CPE framework? What do you think?

Answer	Rationale
Yes	Trust is in very subtle things, it is difficult to make that very hard, except by asking for certifications and quality marks. Trust can also arise from word-of-mouth advertising. Trust can be supported with an SLA

4. From the ecosystem perspective; Do you think active participation of stakeholders should be part of a CPE framework? Is this based on your own experience?

Answer	Rationale
Yes	You also have to be there in an active form of cooperation. That you are available, that you seek cooperation to make the system work better if necessary. And trust can grow out of that.

5. Should the way in which governance related decisions are made within the ecosystem (such as architectural or more operational decisions), be a part of a CPE framework? Why?

Answer	Rationale
Yes	When you want to implement changes, you need to know who is allowed to think about what, who can identify the consequences. In the event of failures, there must already be an escalation route.

Setting up a SLA between CPE organizations is a more formal way of governing the environment; regarding our research subject this could be called a Cloud Data Governance Agreement (CDGA).

6. Do you think setting up a SLA or CDGA should be part of a CPE Framework? Why?

Answer	Rationale
Yes	An SLA establishes agreements with the other partners in the ecosystem, creating clarity about the level of service. That works both ways.

CLOUD GOVERNANCE

Organizations should have governance structures in the form of cloud actors in place for managing cloud resources and participating in cloud processes. These structures should relate to the organisation's cloud business objectives and indirectly to their financial objectives.

7. Regarding an organizations cloud business objectives and financial objectives; Do you think it should be part of a CPE framework? Why? Is this based on your own experience?

Answer	Rationale
Yes, but	Formulating the reason why this ecosystem is actually set up must be done together with the partners in the ecosystem. I find the financial part more difficult, because it is often arranged individually.

8. Do you think that having cloud specific roles in an organization should be part of a CPE framework?

Answer	Rationale
Yes	That's about running the ecosystem. The architecture of the hospital will have to connected to by your suppliers, from which other roles will be created.

9. Is it relevant to include the cloud deployment model in the framework (public, private, hybrid)? Why?

Answer	Rationale
Yes	As a hospital, you choose your own architecture principles and the other partners in the ecosystem will have to connect with them. At the same time, I cannot just switch EHR supplier and we will have to be clear about it in advance.

10. Do education and training of employees need to be included in a CPE framework? Why?

Answer	Rationale
Yes	You want the people who get their hands on things to be certified at least at this level. As a customer you can expect that from your supplier, but also vice versa.

DATA GOVERNANCE

The data governance function can be considered as a collection of master activities for implementation of data governance. It introduces controls for monitoring compliance and reduces risks by creating risk-mitigating policies. Before launching the formal programme it is important for the organization to define the DG requirements and be transparent and accountable about it.

11. Data governance in a cloud platform ecosystem could be handled on the ecosystem level, or within the individual participating organizations. Do you think the decision should be part of a CPE framework? Do you have any experience on this matter?

Answer	Rationale
Yes	Data governance is about who is responsible, who is the owner. If it's in the cloud, what are the rules? Will the policy of the various participants continue to apply?

12. Should the transparency and accountability of data governance be part of a CPE framework? How do you reason?

Answer	Rationale
Yes	You should be able to see what you are doing and make it public or at least make it available to the participants within the ecosystem. And if you want to own something, you also have to bear responsibility.

13. It is important that top-level management is providing support. Do you think that it should be included in this framework? Why? Can you provide examples?

Answer	Rationale
No	There must be a commitment to certain choices that are made, but there must also be a kind of trust in lower management. Principles are also agreed that everyone must adhere to, so no explicit support from management is required.

ROLES & RESPONSIBILITY

Clearly specified roles and responsibilities of that roles will help actors within organizations to understand what is required from them.

14. Do you think that the roles within the CPE should be part of a CPE framework? Can you explain why?

Answer	Rationale
Yes	See question 11

15. Do you think that responsibility that go with these roles should be part of a CPE framework? Can you explain why?

Answer	Rationale
Yes	See question 11

To enable the collaboration between stakeholders, organizations can implement relational governance mechanisms to facilitate them. These mechanisms encompass communication, training and the coordination of decision making.

16. Do you think that governance mechanisms for stakeholder collaboration should be a part of a CPE framework? Why?

Answer	Rationale

Yes	What agreements do you make and how do you ensure that you stay aligned with each other. Especially if your ecosystem consists of multiple organizations on the customer side

PROCESS, PROCEDURE & POLICY

Processes, procedures and policies aim to ensure that data is recorded accurately, held securely, used effectively, and shared appropriately.

17. Do you think that elements of Processes, Procedures & Policies should be part of a CPE framework? Which elements? And can you explain why?

Answer	Rationale
Yes	You can come up with something, but you also have to agree on the processes for this, especially if your organization is going to work across the board. A kind of ITIL, but then transcending the organization level.

18. Do you think that the standardization, documentation and repeatability of CPE processes and procedures should be part of the framework? Why?

Answer	Rationale
Yes	You must record and keep track of agreements and procedures.

TOOLS & MEASUREMENT

To increase the reliability of the data governance process in a cloud environment, measurement is needed. It can be used for overall progress and detected issues, if incoming and existing data meets business rules and if SLA conditions are followed.

19. Do you think that tools & measurement should be part of an CPE framework? Can you explain why?

Answer	Rationale
Yes, but	Measurement should be part of it, but tools shouldn't. You want to be able to measure all technical aspects of the platform by your suppliers, but which tools they use for this is irrelevant.

20. The availability of API's on a cloud platform are an important factor for developer interaction? Do you think it should be part of the CPE framework? Please explain.

Answer	Rationale
Yes	You want to have insight into this in advance.

CLOSING

Question	Answer

Do you think that we missed any governance mechanisms? If so, which?	No, I think that is also because this is a new area for me. That is not to say that the framework is complete, but it may be a blind spot.
Do you think a framework is helpful in a cloud platform ecosystem? Why?	Yes, this is a fairly new area, so the more strongly such a framework is tested or adjusted, the more useful it becomes.
Do you intend to use such a framework? Please explain.	Yes, I always find it useful to make plans based on a model.
Do you find the interview useful for your cloud platform ecosystem? Why?	Ja.

Thank the respondent for the time and confirm that any audio recording will be deleted after processing. An interview report will be sent so that the respondent can verify that everything has been correctly interpreted.

INTERVIEW DC-2

This questionnaire is part of the thesis "Data governance in cloud platform ecosystems"

DEFINITION > CPE: Cloud Platform Ecosystem

INTRODUCTION

The interview will start with a general introduction to explain the goal of the interview and the research objective. After this both interviewer as interviewee will briefly introduce themselves.

STARTER QUESTIONS

Question	Answer
What is your Educational level?	Bachelor – Business Informatics
Which department in your organization do you belong to?	ICT
What is your Function (organizational position)?	Head Operations
How many years of experience do you have in this position?	3 years
How many years of work experience do you have in this industry?	20 years
How would you describe the role of your organization in the platform ecosystem?	Customer. Service management.
In your opinion what are important elements of data governance in a cloud environment ecosystem? Why? Could you give an example?	Security

ECOSYSTEM ORGANISATION

DECISION MAKING

Platform governance can be defined as the partitioning of decision-making authority between platform owners and app developers and control mechanisms. In a PaaS (Platform as a Service) environment, the platform owner is not part of the ecosystem.

1. In a PaaS CPE environment, should the framework include an element regarding decision authority? What would happen if it didn't? Which party should be in the lead?

Answer	Rationale
Yes	You want to reach a certain level towards standardization, but you do not want to lose your colors and that will have to be defended. So I would let the platform take the lead very much, to ensure that you are always sufficiently equipped, for example from a security perspective.

PaaS facilitates the development and deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers.

2. Do you think the pricing component of PaaS Environments should be a part of the CPE framework? Please elaborate.

Answer	Rationale
Yes	With the push of a button, an administrator can create a server and the counter will start running. Not the most important element, but you are going to run into completely new things.

TRUST AND PARTICIPATION OF STAKEHOLDERS

From an ecosystem perspective, participants should adopt transparency and openness to enhance trust so perceived risk can be reduced.

3. Are transparency and openness relevant for a CPE framework? What do you think?

Answer	Rationale
Yes	Who is at my controls. When it comes to availability, continuity is, but not with regard to the technical layer below. Those are commodities.

4. From the ecosystem perspective; Do you think active participation of stakeholders should be part of a CPE framework? Is this based on your own experience?

Answer	Rationale
No	The level of participation of all parties can be recorded in an SLA, making it clear what is expected of everyone. That doesn't have to be clearer than that.

5. Should the way in which governance related decisions are made within the ecosystem (such as architectural or more operational decisions), be a part of a CPE framework? Why?

Answer	Rationale
Yes	Each party has its own architecture principles and the service you purchase must fit within your own principles. Where the hospital is in the lead.

Setting up a SLA between CPE organizations is a more formal way of governing the environment; regarding our research subject this could be called a Cloud Data Governance Agreement (CDGA).

6. Do you think setting up a SLA or CDGA should be part of a CPE Framework? Why?

Answer	Rationale
Yes	Ultimately, an SLA does not guarantee that everything will go well, but it does clearly explain what is expected of everyone.

CLOUD GOVERNANCE

Organizations should have governance structures in the form of cloud actors in place for managing cloud resources and participating in cloud processes. These structures should relate to the organisation's cloud business objectives and indirectly to their financial objectives.

7. Regarding an organizations cloud business objectives and financial objectives; Do you think it should be part of a CPE framework? Why? Is this based on your own experience?

Answer	Rationale
Yes, but	You do have to keep control over your wallet, but this is not a financial choice. I therefore do not find the cost side so relevant. As a customer you do have an objective to be operational at all times, so it is very important to be able to coordinate this with each other.

8. Do you think that having cloud specific roles in an organization should be part of a CPE framework?

Answer	Rationale
Yes	New roles should emerge in your organization to do this, for example managing your suppliers, but it is not certain whether these should be completely new roles or whether it can also be embedded in existing ones.

9. Is it relevant to include the cloud deployment model in the framework (public, private, hybrid)? Why?

Answer	Rationale
Yes	If you go completely to the public cloud with the entire company, it will have an impact on everyone. That will be different if you go for a hybrid variant, for example. And you will really get lost if you don't think about it in advance.

10. Do education and training of employees need to be included in a CPE framework? Why?

Answer	Rationale
No	Training is certainly important with new things, but it is actually too implicit to be included in the framework.

DATA GOVERNANCE

The data governance function can be considered as a collection of master activities for implementation of data governance. It introduces controls for monitoring compliance and reduces risks by creating risk-mitigating policies. Before launching the formal programme it is important for the organization to define the DG requirements and be transparent and accountable about it.

11. Data governance in a cloud platform ecosystem could be handled on the ecosystem level, or within the individual participating organizations. Do you think the decision should be part of a CPE framework? Do you have any experience on this matter?

Answer	Rationale
Yes	You should be able to keep data governance in your own hands, so you should discuss that.

12. Should the transparency and accountability of data governance be part of a CPE framework? How do you reason?

Answer	Rationale
Yes	In the event that one of the parties goes bankrupt, you have no certainty about your belongings. Being transparent and accountable in advance can mitigate that risk.

13. It is important that top-level management is providing support. Do you think that it should be included in this framework? Why? Can you provide examples?

Answer	Rationale
Yes	This is not an IT only happening, it belongs to the entire company. It has both a major financial impact and a major impact on HR.

ROLES & RESPONSIBILITY

Clearly specified roles and responsibilities of that roles will help actors within organizations to understand what is required from them.

14. Do you think that the roles within the CPE should be part of a CPE framework? Can you explain why?

Answer	Rationale
Yes	Parties in the ecosystem can expect from each other that certain roles are fulfilled, but that does not necessarily have to be the case. Then it is useful to be clear about this in advance.

15. Do you think that responsibility that go with these roles should be part of a CPE framework? Can you explain why?

Answer	Rationale
Yes	This is related to the roles, which are related to each other.

To enable the collaboration between stakeholders, organizations can implement relational governance mechanisms to facilitate them. These mechanisms encompass communication, training and the coordination of decision making.

16. Do you think that governance mechanisms for stakeholder collaboration should be a part of a CPE framework? Why?

Answer	Rationale

Yes	This is not necessary on the underlying technical level, that just has to work. But at the level where services are managed it is important to keep in touch with each other. For example about escalation procedures.

PROCESS, PROCEDURE & POLICY

Processes, procedures and policies aim to ensure that data is recorded accurately, held securely, used effectively, and shared appropriately.

17. Do you think that elements of Processes, Procedures & Policies should be part of a CPE framework? Which elements? And can you explain why?

Answer	Rationale
Yes	Policy matters in particular must be widely discussed, for example about data retention. The administrator cannot determine this himself. Who has ownership of certain matters and is allowed to make choices. That can have an impact on the entire ecosystem.

18. Do you think that the standardization, documentation and repeatability of CPE processes and procedures should be part of the framework? Why?

Answer	Rationale
Yes	Those processes must be coordinated, so they must be in line with each other. If you as a customer want to implement a change, then that change process must be in line with the change process at the other party. It is also important that there is no mismatch in the size of the mutual parties.

TOOLS & MEASUREMENT

To increase the reliability of the data governance process in a cloud environment, measurement is needed. It can be used for overall progress and detected issues, if incoming and existing data meets business rules and if SLA conditions are followed.

19. Do you think that tools & measurement should be part of an CPE framework? Can you explain why?

Answer	Rationale
Yes, but	You want to keep a grip on business operations, I have a lot of conversations about uptime, availability and continuity. You have to agree in advance what you want to measure. Tooling is less relevant.

20. The availability of API's on a cloud platform are an important factor for developer interaction? Do you think it should be part of the CPE framework? Please explain.

Answer	Rationale

Yes	If data exchange is to be established in a certain way, then it must be in an architectural manner. And so you have to coordinate that with each other.

CLOSING

Question	Answer
Do you think that we missed any governance mechanisms? If so, which?	No
Do you think a framework is helpful in a cloud platform ecosystem? Why?	Yes. It forces you to think about a number of things and that will help you with the conversations that are being held. It gives you much more the resources to get behind the wheel
Do you intend to use such a framework? Please explain.	Yes, sure.
Do you find the interview useful for your cloud platform ecosystem? Why?	Yes.

Thank the respondent for the time and confirm that any audio recording will be deleted after processing. An interview report will be sent so that the respondent can verify that everything has been correctly interpreted.

INTERVIEW DC-3

This questionnaire is part of the thesis "Data governance in cloud platform ecosystems"

DEFINITION > CPE: Cloud Platform Ecosystem

INTRODUCTION

The interview will start with a general introduction to explain the goal of the interview and the research objective. After this both interviewer as interviewee will briefly introduce themselves.

STARTER QUESTIONS

Question	Answer
What is your Educational level?	HBO Agricultural
Which department in your organization do you belong to?	Information management.
What is your Function (organizational position)?	Technical Architect, in practice also partly EA architect. Because of a vacancy.
How many years of experience do you have in this position?	3 years
How many years of work experience do you have in this industry?	20 years
How would you describe the role of your organization in the platform ecosystem?	Guard of the process. Guardian of privacy guidelines. Determinative.
In your opinion what are important elements of data governance in a cloud environment ecosystem? Why? Could you give an example?	Security & Privacy.

ECOSYSTEM ORGANISATION

DECISION MAKING

Platform governance can be defined as the partitioning of decision-making authority between platform owners and app developers and control mechanisms. In a PaaS (Platform as a Service) environment, the platform owner is not part of the ecosystem.

1. In a PaaS CPE environment, should the framework include an element regarding decision authority? What would happen if it didn't? Which party should be in the lead?

Answer	Rationale
Yes	As an organization you want to influence where the data is stored (which region).

PaaS facilitates the development and deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers.

2. Do you think the pricing component of PaaS Environments should be a part of the CPE framework? Please elaborate.

Answer	Rationale
Yes	There is a difference in the cost structure between on-premise and in the Cloud, which makes it difficult to compare them. If you are going to outsource, you must also have a good exit strategy, for example if in the future it turns out that the costs will become too high or if external stakeholders exert pressure to retrieve data from a Cloud environment.

TRUST AND PARTICIPATION OF STAKEHOLDERS

From an ecosystem perspective, participants should adopt transparency and openness to enhance trust so perceived risk can be reduced.

3. Are transparency and openness relevant for a CPE framework? What do you think?

Answer	**Rationale**
Yes	The closer you are to the data, the more important it becomes. As a hospital, we already require ISO 27001 and NEN 7510 certifications from our suppliers. If you do not control this, you may end up in a situation of unwanted data access.

4. From the ecosystem perspective; Do you think active participation of stakeholders should be part of a CPE framework? Is this based on your own experience?

Answer	**Rationale**
Yes	Especially when it comes to data exchange. To prevent a situation of power politics arises, in which data could be used as a hostage object. I just don't see it happening automatically, but a partnership is more useful than a customer-supplier relationship.

5. Should the way in which governance related decisions are made within the ecosystem (such as architectural or more operational decisions), be a part of a CPE framework? Why?

Answer	**Rationale**
Yes	If the participating organizations in the ecosystem make 'local' choices, this can have an impact on the platform and agreements must be made about this.

Setting up a SLA between CPE organizations is a more formal way of governing the environment; regarding our research subject this could be called a Cloud Data Governance Agreement (CDGA).

6. Do you think setting up a SLA or CDGA should be part of a CPE Framework? Why?

Answer	**Rationale**
Yes	An SLA is often the guarantee of many matters that must be arranged in technology for the provision of services. I would rather see Cloud brokers being used as an intermediary between Cloud parties and hospitals, for example.

Organizations should have governance structures in the form of cloud actors in place for managing cloud resources and participating in cloud processes. These structures should relate to the organisation's cloud business objectives and indirectly to their financial objectives.

7. Regarding an organizations cloud business objectives and financial objectives; Do you think it should be part of a CPE framework? Why? Is this based on your own experience?

Answer	**Rationale**
Yes	In a cloud environment the possibilities are endless, but the business is not always aware of the financial impact that the possibilities entail in a cloud environment. At the same time, you want to keep the possibility open to get rid of it.

8. Do you think that having cloud specific roles in an organization should be part of a CPE framework?

Answer	**Rationale**
Yes	In any case, you have to assume that role in which someone is responsible for the resources within a certain environment. You actually have to apply a lot of automation to that. But if that automation has to be managed by someone again, then you actually get a new kind of application manager role.

9. Is it relevant to include the cloud deployment model in the framework (public, private, hybrid)? Why?

Answer	**Rationale**
Yes	I take a hybrid solution into account because certain equipment in the hospital generates a lot of data that must be available quickly. And the latency to and from the cloud can be an obstacle.

10. Do education and training of employees need to be included in a CPE framework? Why?

Answer	**Rationale**
Yes	Technical awareness, the technology is often fantastic, but if no one understands it, the most terrible things will happen. Continuity of the business can be jeopardized or the costs become too high.

Data Governance

The data governance function can be considered as a collection of master activities for implementation of data governance. It introduces controls for monitoring compliance and reduces risks by creating risk-mitigating policies. Before launching the formal programme it is important for the organization to define the DG requirements and be transparent and accountable about it.

11. Data governance in a cloud platform ecosystem could be handled on the ecosystem level, or within the individual participating organizations. Do you think the decision should be part of a CPE framework? Do you have any experience on this matter?

Answer	**Rationale**
Yes, maybe	You work on the data together with various parties. The quality of the data determines how it can be used and all parties may benefit from this. On the other hand, it may also be the case that a difference of interpretation arises and then the hospital's opinion is again leading.

12. Should the transparency and accountability of data governance be part of a CPE framework? How do you reason?

Answer	**Rationale**
Yes	You always want to know when things change in the environment, who has been where, who has looked where. External stakeholders can also ask questions about, for example, the logging of cases. Nen standards are also about that.

13. It is important that top-level management is providing support. Do you think that it should be included in this framework? Why? Can you provide examples?

Answer	**Rationale**
No	The top-level management are decision-makers. They have to make the choice once and then it's back to implementation.

Roles & Responsibility

Clearly specified roles and responsibilities of that roles will help actors within organizations to understand what is required from them.

14. Do you think that the roles within the CPE should be part of a CPE framework? Can you explain why?

Answer	**Rationale**
Yes	I think you should assign a number of roles differently, that you get a shift in that and that would be useful to include in the framework.

15. Do you think that responsibility that go with these roles should be part of a CPE framework? Can you explain why?

Answer	**Rationale**
Yes	This is linked to the roles, I wouldn't want to pull those 2 apart.

To enable the collaboration between stakeholders, organizations can implement relational governance mechanisms to facilitate them. These mechanisms encompass communication, training and the coordination of decision making.

16. Do you think that governance mechanisms for stakeholder collaboration should be a part of a CPE framework? Why?

Answer	**Rationale**
Yes	Then you can get all kinds of timing issues in which your party may come up with certain things earlier than another. Perhaps at a certain point when that maturity also increases, you will find that the parties will find each other more quickly.

[Part 2 of the interview]

Process, Procedure & Policy

Processes, procedures and policies aim to ensure that data is recorded accurately, held securely, used effectively, and shared appropriately.

17. Do you think that elements of Processes, Procedures & Policies should be part of a CPE framework? Which elements? And can you explain why?

Answer	**Rationale**
Yes	You want to be able to determine in advance what the data strategy will be. Which retention periods are relevant to me and how will I exchange data with other parties? That is also related to legislation. As a hospital you actually want to be able to switch easily in applications to places where you think there is a lot of added value for the primary process.

18. Do you think that the standardization, documentation and repeatability of CPE processes and procedures should be part of the framework? Why?

Answer	**Rationale**
No	Necessary, but obvious. Belongs to the maturity of an environment, you can expect that the documentation is correct. In the future, I expect less documentation and more in repeatable runbooks. That is a script that in its own form actually serves as documentation.

Tools & Measurement

To increase the reliability of the data governance process in a cloud environment, measurement is needed. It can be used for overall progress and detected issues, if incoming and existing data meets business rules and if SLA conditions are followed.

19. Do you think that tools & measurement should be part of an CPE framework? Can you explain why?

Answer	**Rationale**

Yes & No	The tools you use within such an environment are indeed important, because if you are standardized on them. If you use runbook automation, it matters what environment it is for. Interoperability would then be preferred. I think Measurements have more to do with maturity. Or as part of your SLA.

20. The availability of API's on a cloud platform are an important factor for developer interaction? Do you think it should be part of the CPE framework? Please explain.

Answer	**Rationale**
Absolutely	You might even want to go so far as to standardize the syntax of APIs. Syntax of APIs (not all the same), to be able to move.

CLOSING

Question	**Answer**
Do you think that we missed any governance mechanisms? If so, which?	Data masking / data security (privacy)
Do you think a framework is helpful in a cloud platform ecosystem? Why?	Yes, I do think it will help you to think about the steps that you will face as a company. So, you may not need to apply your entire framework for it to be usable. But it is important that you just think about it.
Do you intend to use such a framework? Please explain.	Yes. Depends on how available it is and whether it is also recommended by official bodies.
Do you find the interview useful for your cloud platform ecosystem? Why?	Yes.

Thank the respondent for the time and confirm that any audio recording will be deleted after processing. An interview report will be sent so that the respondent can verify that everything has been correctly interpreted.

APPENDIX D7: RESULTS DETAILS

RESULTS REGARDING ECOSYSTEM GOVERNANCE

QUESTION 1: IN A PAAS CPE ENVIRONMENT, SHOULD THE FRAMEWORK INCLUDE AN ELEMENT REGARDING DECISION AUTHORITY? AND WHY?

Only respondent SI-2 indicated that there is no relevance for this element in the framework. When asked to explain, the respondent stated that "Ownership of the platform lies with the hospital" and "Everyone is responsible for their own piece". Other respondents don't seem to disagree, but they did want to include this element. Respondents for the DS organisation responded with: "it would have to be clear who is responsible for which aspects", "The people who create contents for the consumers should be in the lead" and "The lines become blurred when changes are made within a lower scope of decision making". The respondents from the DC organisation are a bit more focussed on control because "Otherwise everyone will have a free hand", or "you do not want to lose your colours and that will have to be defended". Respondent SI-1 concluded that "In public cloud environments you have little influence on the platform".

QUESTION 2: DO YOU THINK THE PRICING COMPONENT OF PAAS ENVIRONMENTS SHOULD BE A PART OF THE CPE FRAMEWORK? AND WHY?

Only respondent DC-1 indicated that there is no relevance for this element in the framework, because "price is more of a financial element, which is assigned to 1 party in the ecosystem" and thus the responsibility for only one of the organisations in the ecosystem. Other respondents don't seem to deny who pays the bill but do have other considerations. They emphasise that "there is a difference in the cost structure between on-premise and in the cloud" (DC-3), "different vendors are going to have different prices" (DS-2) and "an administrator can create a server and the counter will start running" (DC-2). Also respondent SI-1 and DC-3 noted that "you must also have a good exit strategy" (DC-3, SI-1), because "you will get data in, but getting it out again suddenly becomes very expensive" (SI-1). Three respondents pointed attention to the fact that "you can make different kind of decisions on processing power for certain processes" (DS-2), "within the platform there are always alternatives that you could choose, for different prices" (SI-2) and "they would need to be able to project the costs no how it might expand" (DS-1).

QUESTION 3: ARE TRANSPARENCY AND OPENNESS RELEVANT FOR A CPE FRAMEWORK? AND WHY?

All respondents see the relevance of this element for the framework. The respondents from the DS company approach this from the joint effort in the ecosystem by saying that "you have to make sure that everybody is on the same page or else you might have an undesired outcome" and that it's important "to assess mutual risk, especially under with sensitive information". The DC company would want to know "who is at my controls", because "The closer you are to the data, the more important it becomes" and "trust is in very subtle things". Their approach seems to reason more from themselves than from the ecosystem. The respondents from the SI company also agree with the relevance of this element, but they find it "important, but difficult to measure" and "dependent on the context of the platform and its strategic importance to the organization".

Question 4: From the ecosystem perspective; Do you think active participation of stakeholders should be part of a CPE framework? And why?

Only DC-2 denies the relevance of this element, since “the level of participation of all parties can be recorded in an SLA, making it clear what is expected of everyone”. The other respondents from the DC company approach the subject from cooperation by “having to be there in an active form of cooperation, to make the system work better if necessary” (DC-1), “a partnership is more useful than a customer-supplier relationship” (DC-3) and “trust can grow out of that” (DC-1). The DS company respondents look at it in a conditional way “otherwise we would not want to invest our own resource knowing that it's not going to be successful” (DS-1) and “because you almost always can't make a decision on one without affecting the other” (DS-2). From the SI company however, the respondents reason from possible risks: “you want to know how active the ecosystem is” (SI-1), and “if you are not involved as a stakeholder, other parties in the ecosystem cannot proactively make changes and damage may occur” (SI-2).

Question 5: Should the way in which governance related decisions are made within the ecosystem (such as architectural or more operational decisions), be a part of a CPE framework? And why?

Only SI-1 found this element to be non-relevant to the framework, because “all successful platforms have governance with 1 party” and ”if you open it up completely, you get a ‘poldermodel’ ”. DC-2 responded to this question with “each party has its own architecture principles and the service you purchase must fit within your own principles” and DC-3 thinks that “if the participating organizations in the ecosystem make 'local' choices, this can have an impact on the platform”. And other respondents vary their responses. From “You need a governance group that come together and make decisions which should be enforced within the ecosystem to some extent” (DS-2), to “decisions in a certain area are taken by a certain party, it must be clear where the decisions are made” (SI-2). In any case respondents think that “in the event of failures, there must already be an escalation route” (DC-1), but also think that “the hospital is in the lead” (DC-2).

Question 6: Do you think setting up an SLA or CDGA should be part of a CPE Framework? And why?

Four respondents (DS-2, DC-1, DC-2, SI-2) indicate that an SLA clearly explains what is expected of everyone and should therefore be included in the framework. But DC-2 also indicates that “an SLA does not guarantee that everything will go well”. DS-2 adds that although adding an SLA is relevant that “if you ever actually have to pull an SLA up and look at it, you failed”. SI-1 adds that an SLA could be useful in cases where “you want to know in advance if you can get your data into the cloud but not out again”. DC-3 agreed with the relevance, but also posited the alternative “cloud brokers being used as an intermediary between Cloud parties and hospitals”. Finally, DS-1 made a conditional statement “you should have your freedom to have your own service level agreement with your customers so that would be at a local level”.

Results regarding cloud governance

Question 7: Regarding an organizations cloud business objectives and financial objectives; Do you think it should be part of a CPE framework? And why?

During the interviews the respondents had different opinions about both types of objectives. All respondents agreed that the cloud business objectives of an organisation should be part of the framework. Respondent SI-1 indicated that “you move to the cloud because you think you have

certain benefits" and DC-1 thinks that creating the cloud business objectives should be done together with the partners in the ecosystem. DC-2 goes a step further by stating that "you have an objective to be operational at all times". Respondent DS-1 argues that you need an understanding how to scale resources in a cloud environment in order to meet your objectives.

Regarding the financial objectives, respondents were less in agreement. Respondents DC-1 and DC-2 both found that costs as such are a relevant factor for a cloud environment, but that the financial objectives are arranged within the individual organisations within the ecosystem. Others find it more relevant to include in the framework because "the possibilities are endless, but the business is not always aware of the financial impact of them" (DC-3) and "If saving costs is a goal, then you also have to measure that, so you can make your own IT team leaner and meaner" (SI-2)

Question 8: Do you think that having cloud specific roles in an organization should be part of a CPE framework? And why?

The answers to this question were a bit more diffuse. 1 respondent (DS-1) found that having cloud specific roles is "inevitable" and it "seems to be a core definition", so it therefore should not have to be included in the framework. Other respondents seem more confident to include the element, because it's "about running the ecosystem" (DC-1) and that cloud environments create new functionality that need to be managed in a different way and "you have to assume the role" (DC-3). 4 respondents gave a positive, but conditional response. Some of the remarks were "only when you get to a critical mass", "a number of things can be secured in the existing IT team", "mention that someone picks them up" and "it can also be embedded in existing roles".

Question 9: Is it relevant to include the cloud deployment model in the framework (public, private, hybrid)? And why?

For this element all respondents agreed that it should be included in the framework. It's a decision about which parts to solve in the cloud and which parts are still done in-house (SI-1). The processes you have to protect the data depends on the kind of cloud deployment model (DS-2) and If you go completely to the public cloud with the entire company, it will have an impact on everyone (DC-2). Apparently certain equipment in the hospital generate a lot of data and have an impact on the choice of deployment model (DC-3), while there is a fairly substantial investment component to be considered (SI-2).

Question 10: Do education and training of employees need to be included in a CPE framework? And why?

To this question, only respondent DC-2 believes that it does not have to be part of the framework because "it is too implicit to be included". Most respondents indicate that training employees for their interaction with the platform is important to "ensure that staff could ensure uninterrupted delivery" (DS-1), and to let them "understand what they're dealing with and how they're interacting with it" (DS-2), also "people who get their hands on things need to be certified" (DC-1). Respondent DC-3 indicated that in absence of proper education "continuity of the business can be jeopardized, or the costs become too high".

RESULTS REGARDING DATA GOVERNANCE

QUESTION 11: DATA GOVERNANCE IN A CLOUD PLATFORM ECOSYSTEM COULD BE HANDLED ON THE ECOSYSTEM LEVEL, OR WITHIN THE INDIVIDUAL PARTICIPATING ORGANIZATIONS. DO YOU THINK THE DECISION SHOULD BE PART OF A CPE FRAMEWORK? AND WHY?

Respondent DS-2 indicated that this element does not have to be included, because it is clear that all participants in the ecosystem have their own role in the whole. DS-2 sees it as "layers of ecosystems on top of ecosystems" and that there is a "technical box around the hospital within which it should be an individual decision maker", but "on the underlying level, the data supplier is the primary decision maker, and it's their responsibility to inform those organizations of the decisions made", although "the Data Supplier should have limited to no input in that data governance strategy".

DS-1 answered that there should be a baseline about this subject at the ecosystem system level and that on a "local level you would require the principles to match that". DC-1 and SI-1 agree with that and think that this element should be used to decide "who is responsible, who is the owner" and to prevent "difference in expectations". 2 respondents (DC-2, SI-1) seem to be arguing this point from the risk of losing control: "you should be able to keep data governance in your own hands" and "in an ecosystem that you do not control yourself, you want to know how it is managed"

Both DC-3 and SI-1 see the hospital as driving force in this ecosystem, but "several parties have to deal with the data on the platform" (SI-1).

QUESTION 12: SHOULD THE TRANSPARENCY AND ACCOUNTABILITY OF DATA GOVERNANCE BE PART OF A CPE FRAMEWORK? AND WHY?

All respondents agree about this element being in the framework. The responses given can be grouped into 2 categories: Control and Prevention.

Regarding control, DS-2 stated that "you need transparency and accountability to track how decisions are made and enforced and in case of violations". DC-3 and DC-1 endorse this by saying that "you always want to know when things change in the environment, who has been where, who has looked where" and "other parties should be able to see what you are doing by making it public". DS-1 clarifies that "being able to demonstrate certain security practices, is often part of certification", which would help in establishing transparency and accountability. Finally, DC-3 thinks that this element is valid also because external stakeholders can also ask questions about the platform and that calls for preparation.

Regarding prevention, DC-2 indicated the risk of bankruptcy of suppliers, "you have no certainty about your belongings". Being transparent and accountable in advance can mitigate that risk. DS-2 stated that companies need to make sure such events don't happen again, "you want to know how it works for everything that is offered on that platform (SI-1). Finally, SI-2 provided an example where "a customer who emphatically did not want to share the definitions and thus explicitly chose not to be transparent or accountable". Such situations should be clear in advance.

Question 13: It is important that top-level management is providing support. Do you think that it should be included in this framework? And why?

2 respondents do not feel this element should be part of the framework (DC-1, DC-3), because "there must be a kind of trust in lower management", "Principles are also agreed that everyone must adhere to, so no explicit support from management is required" and "top-level management have to make an informed choice once and then leave it to the lower tiers"

The other 5 respondents think differently; "from a process standpoint to make sure that there is executive buy-in for the architecture strategy" (DS-1) and "you want your Board to be informed and aware of the risks" (SI-1). DS-2 goes a step further by saying that "everybody should be involved". The respondent does not believe in micromanagement but wants "the level of awareness and support that's necessary for the situation". DC-2 thinks "the platform belongs to the entire company and has both a major financial impact and a major impact on HR" and so top-level management support should be included. SI-2 indicated that "you need the organizational power to push through", when resistance arises in the organization.

Question 14: Do you think that the roles within the CPE should be part of a CPE framework? And why?

All respondents agree about this element being in the framework. 2 respondents agree that this about the support of the platform (DS-1, DS-2), "pretty fundamental to be clear who's going to deal with errors or issues that arise", "you should always come to a set of defined roles that are necessary for supporting the platform". And DC-2 thinks that it is useful to be clear about this in advance, because it does not necessarily have to be the case that certain roles are fulfilled. Finally SI-1 stipulates that "in a cloud ecosystem there is no hierarchical line to enforce things, so you have to make agreements about this" and SI-2 concurs by saying that you should be aware "where decisions can be taken and where decisions should not be taken".

Question 15: Do you think that responsibility that go with these roles should be part of a CPE framework? And why?

All respondents are in agreement about this element being in the framework, 5 of them (DC-1,DC-2,DC-3,SI-1,SI-2) suggested to relate this closely to question 14 ("this is related to the roles"," I wouldn't want to pull those 2 apart"). SI-2 added that "service integrators will have to obtain approval from the hospital in basically every situation". Respondent SI-1 argued about this element that it is good to define them since "you now have to rely on people in other organizations".

The 2 other respondents (SI-1, SI-2) do see responsibility as something that should be treated separately. "Most people would have a standard conception of the basic roles, but it's still useful to itemize that just in case", according to DS-1. And respondent DS-2 said, "people can operate fairly independently on the platform, and these people need to understand how to interact properly with it".

Question 16: Do you think that governance mechanisms for stakeholder collaboration should be a part of a CPE framework? And why?

All respondents agree about this element being in the framework. 3 of the respondents (DS-1, DC-1, DC-1, DC-2) agreed that this is element is to "stay in touch" or "stay aligned" with the other parties in the ecosystem, especially "if you are contributing data to shared resources" or "if your ecosystem consists of multiple organizations on the customer side". Methodically, respondents DS-

2 and SI-2 think that there should be “an outline of how collaboration should be done, without being too rigid” and that “it must be clear what the subjects of communication will be and the way in which they are communicated” (e.g. daily stand-ups). DC-3 indicated that it might be a risk “when you come up with certain things earlier than another party” because then “you can get all kinds of timing issues”.

DC-2 had a remark that this element is not relevant “on the underlying technical level, that just has to work” and respondent SI-1 believes this element is only relevant for larger cloud services where “the platform requires intensive collaboration”.

Question 17: Do you think that elements of Processes, Procedures & Policies should be part of a CPE framework? Which elements? And why?

All respondents agree about this element being in the framework. Respondent DS-1 said that this element is relevant to be able to understand “how the data is safely and securely getting to the cloud” and this applies to anything that’s security related and “you also have to agree on the processes for what you come up with”. DS-2 thinks that organisations in the ecosystem “need to provide a mechanism through which these things can be done”

According to SI-2, hospitals “adhere to fairly long filing deadlines”. 3 respondents (DC-2, DC-3, DS-1) supplied an example of this element “about data retention”, “which retention periods are relevant” and “deleting healthcare data after a certain period of time”. DS-1 indicated that complying to these standards is necessary “perhaps even more so in the cloud” and “you also want to know how it is arranged in terms of security and quality” (SI-1).

DC-2 indicates that the question “Who has ownership?” is also relevant for this element. And in terms of policies, DC-3 remarked that “as a hospital you actually want to be able to switch easily in applications” without having to worry too much about the data.

Question 18: Do you think that the standardization, documentation and repeatability of CPE processes and procedures should be part of the framework? And why?

Opinions were divided for this element. 2 respondents (DS-1, DC-3) argued that this element is not relevant for the framework because documentation on policies and procedures ”is less important in the ecosystem, it's more implicit” and “necessary, but obvious”. DC-3 also indicated that in the near future “repeatable scripts will actually serve as documentation”.

Respondent DS-2 is in doubt whether this element should be included. On the one hand “there should be a template for these processes for repeatability and documentation reasons”. But in case of “many custom processes and variations, it doesn’t make sense”.

4 respondents (DC-1, DC-2, SI-1, SI-2) indicated that this element is relevant because “you must record and keep track of agreements and procedures” and “those processes must be coordinated”. Also “the change process must be in line with the change process of the other party”. “You place part of the responsibility with other partners on the platform”, “to a certain extent, you will have to rely on the other partners”.

SI-2 had a conditional remark about repeatability, because “you only go to the cloud once so that just does not need to be repeated” and about the repeatability of processes, “they follow from standardization”

DC-2 made a side remark about the importance of selecting the right "size" of partners: "It is also important that there is no mismatch in the size of the mutual parties.". This remark was intended to serve as a prevention to become a too small customer for your supplier with the risk of being under-served.

QUESTION 19: DO YOU THINK THAT TOOLS & MEASUREMENT SHOULD BE PART OF AN CPE FRAMEWORK? AND WHY?

All respondents agree about this element being in the framework, although 3 respondents (DS-1, DC-1, DC-2) thought that tools had no relevance for the framework, only measurement. "Tools are implied by the SLA" (DS-1), "which tools your suppliers use is irrelevant" (DC-1), "tooling is less relevant" (DC-2) are their responses. On the other hand, DC-3 thought the opposite by saying that "tools are indeed important, because interoperability is preferred" and "measurements have more to do with maturity or as part of an SLA".

The other respondents would include both elements into the framework. DS-2 argued that "you should be able to provide the metrics and the real time data to be able to understand how your platform is operating". SI-1 indicated that "on a platform you need tooling" in order to "view turnaround times, versions, statuses, etc" and this will "allow you to gain insight into the system". And respondent SI-2 also said that "tools that run on the platform that affect daily operation" should be part of the framework, but "technical choices to be made on the platform" should not. SI-2 also commented that once "you formulate those objectives, you must have measurements in place".

QUESTION 20: THE AVAILABILITY OF API'S ON A CLOUD PLATFORM ARE AN IMPORTANT FACTOR FOR DEVELOPER INTERACTION, DO YOU THINK IT SHOULD BE PART OF THE CPE FRAMEWORK? AND WHY?

Although 6 out of 7 respondents reacted positively to this question and even added the terms "mandatory" and "absolutely", respondent SI-2 indicated that this was an open door. "a cloud platform cannot function without APIs", so availability of them is not an issue and the element is perhaps not of added value to the framework. The other 6 respondents thought that "it's probably the whole point you're using the cloud" (DS-1), "you just want to know how to interact with something that is much more of a black box than before"(SI-1), "A modern system needs to be extensible" because "data interoperability is required" (DS-2) and "you want to have insight into this in advance" (DC-1)

Respondent DC-3 even wanted to go so far as to "standardize the syntax of APIs", because APIs are usually custom made and need tailoring to connect to.

RESULTS REGARDING FINAL QUESTIONS

We concluded each interview by asking a few closing questions

FQ1-DO YOU THINK THAT WE MISSED ANY GOVERNANCE MECHANISMS?

3 respondents could not come up with governance mechanisms that should have been added to the framework. The suggestions of others are presented in the following.

DS-1 responded as follows: "Case related governance. So, if you're agreeing to harmonize data for example for research purposes, you might have a counsel that helps you govern what the priorities are". DS-2 indicated that we missed a voice of the customer: "I think the one thing that needs to be

represented maybe that we didn't call out is the patient's perspective. If we're talking specifically about healthcare and healthcare governance, I think you have to have one arm. That is understand at minimum understanding the patient's perspective". Respondent DC-3 argued that because of the privacy sensitive nature of the data in hospitals there should be some element with regards to masking the data so it is unreadable, but developers can use it to test on. And finally, respondent SI-1 made a remark about "the physical location of such an ecosystem. If it is in Dutch hands, is it European, international, also really an essential to record". We will reflect on these findings further in chapter 5.

FQ2-Do you think a framework is helpful in a cloud platform ecosystem? Why?

All respondents agreed that a framework is helpful for governing cloud platform ecosystems. The responses range from "you have put a solid checklist together of base level understanding" and "checklists are useful" to "It forces you to think about a number of things and that will help you with the conversations that are being held" and "A lot of decision makers don't understand what it means to work in the cloud ecosystem". Also, they feel that "the more strongly such a framework is tested or adjusted, the more useful it becomes"

FQ3-Do you intend to use such a framework? Please explain.

Only respondent SI-1 answered "no" to this question, because the system integrator itself had already developed such a framework for own use, based on experience. The same applied for the data supplier organization. The other respondents intended to use such a framework because they "find it useful to make plans based on a model". Finally, DC-3 made a remark that for framework as these to be used in a hospital situation it would be helpful that it gets approved by the Dutch standardization office for hospitals (Nictiz).